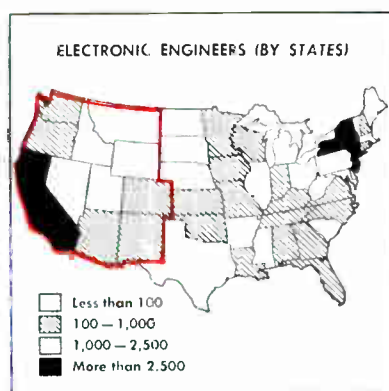


AUGUST 10, 1957

# electronics

## business edition

A MCGRAW-HILL PUBLICATION • VOL. 30, NO. 8A • PRICE FIFTY CENTS



## Wescon Marks Growth in West

Eleven-state area takes one quarter of industry sales . . . . . p 13



## Data Recording Rides High

Missiles boost market for instrument tape recorders . . . . . p 22

# NEW—Raytheon Amplitron

Now—peak power 800 kw, bandwidths of 10%  
with efficiencies of 50-70% over entire band



**QK520 Amplitron  
Typical Operation (Pulsed)**

Anode Voltage . . . . . 40 kV  
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Phase Stability  
with Anode Current . . . . .  $1^\circ/\text{amp}$

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RAYTHEON AT WESCON—BOOTHS 2921-2922

# electronics business edition

A MCGRAW-HILL PUBLICATION • VOL. 30, NO. 8A • AUGUST 10, 1957

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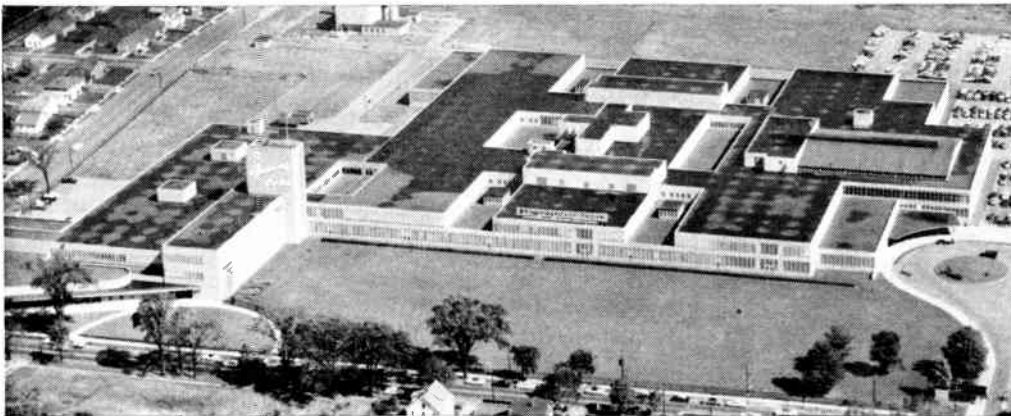
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The facilities offered in this announcement are housed in the new 800,000 square foot "Electronics Center." Manufacturers' executives interested in this type of ultra-modern production are cordially invited to visit us.

If your end product is in the general areas of radio, television, electrical appliances, automotive circuits, aircraft guidance and associated parts or equipment—and you are currently using conventional point-to-point wiring—we can offer you greatly increased production with higher accuracy and lower manufacturing cost.

Basically, our facilities comprise a completely mechanized line with four steps:

**FIRST**, the fabrication of Printed Wiring Boards.

**SECOND**, the automatic assembly of Components.

**THIRD**, the automatic Dip-Soldering of completed assemblies.

**FOURTH**, automatic testing.

### **Complete integration**

The Stromberg-Carlson system employs the "in line" concept of integrated production.

The process starts with the accurate registration of holes for subsequent operations. There follow steps of cleaning and sensitiz-

ing, exposing, developing, etching, sawing and perforating, then automatic assembly and dip soldering.

Production rates range from 600 to 1200 completed units per hour. The system is technically and economically effective for production lots as low as 500 units.

Also, we are prepared to accept work in any single one of the three phases—printed wiring boards, assembly or dip soldering.

### **Already at work!**

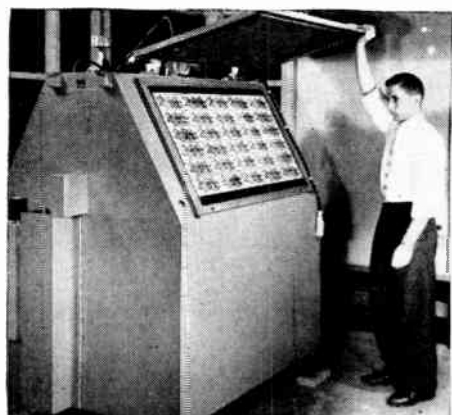
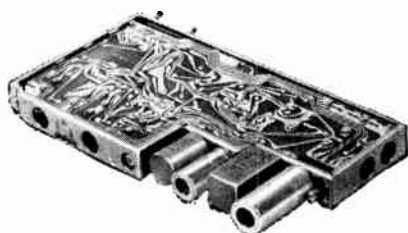
The Automation Manufacturing System is already buzzing. We designed, and are producing, a radio for one of America's newest cars.

Our assignment is the full job: production of printed wiring boards, automatic assembly of components, testing and dip soldering. An interesting part of this project is that an important section of the circuit employs *transistors* instead of tubes, cutting down weight and greatly minimizing the effects of road shock.

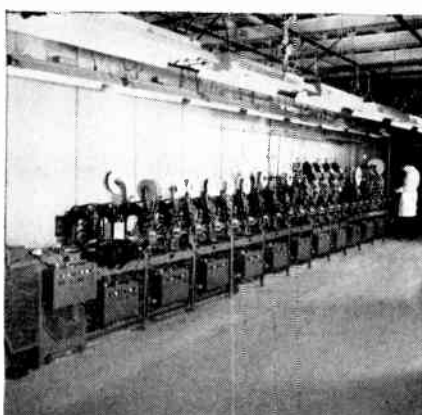
# ELECTRICAL PRODUCTS

development, opens to you its new

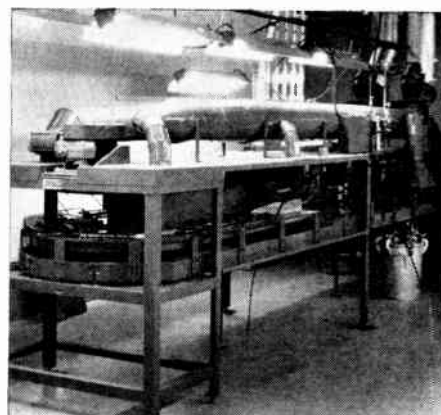
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# Issuing Stock Now?

**Firms save through Regulation A exemptions when selling stock. But caution is advised in making underwriting contracts**

Now is the time for electronic companies to take advantage of Regulation A benefits of the Securities and Exchange Act, says security dealer Myron A. Lomasney.

"There are fashions in stocks, and small electronic firms with good growth prospects are in style on Wall Street today," says Lomasney.

The recent Magnetic Amplifiers common stock issue under Regulation A was planned by Lomasney, then a partner in D. A. Lomasney Co. He now heads his own firm, Myron A. Lomasney & Co. of New York.

Regulation A was designed to assist small businesses and new ventures in bringing new issues to market. Fourteen-hundred companies raised nearly \$300 million under its terms in 1956. Most were less than two years old.

Security issues of less than \$300,000 qualify for Regulation A exemptions. Main benefit is exemption from SEC's regular prospectus requirement.

Instead, a short offering circular is required. Accounting, printing and legal expenses of preparing the offering circular are about \$5,000. Costs of preparing the full prospectus can be expected to run from \$15,000 to \$25,000.

Also, time taken to complete the financing is usually less because of faster approval by SEC and less paperwork.

The price at which these small issue electronics stocks can be sold in today's market is roughly 12-14 times earnings and two-three times book value, underwriters say.

Net amount received by the issuing firm will have had underwriter's commission subtracted. Most commissions on Regulation A issues are within 15 percent, according to *Investment Dealer's Digest* statistics.

Most investment bankers are selective about the firms they underwrite. They want firms with a recognizable pattern of growth and a proprietary position based on patents, scientific advances or productive ability.

Investors also want good management. They particularly want some member of management to have knowledge of finances, accounting controls and budgeting.

Size of companies that best qualify for the small issues is hard to nail down, says Lomasney. Minimum sales are usually \$500,000, but there are many exceptions.

As Regulation A stock issues are usually a firm's first public offering, a successful issue is of paramount importance. When a first issue is unsuccessful, it is often difficult for a firm to raise money again in security markets.

Consequently, Lomasney urges issuing firms to enter into underwriting contracts that contain firm buying commitments by the underwriter.

Two other types of contracts are available: best efforts and all or nothing. Under best-efforts contracts, the underwriter can discontinue selling efforts after selling part of the issue. Under all-or-nothing contracts, no stock is sold unless the underwriter is able to dispose of all of the stock.

Other electronic firms that have issued securities under Regulation A include: Universal Transistor Products, Electronic Specialties, General Transistor, G-L Electronics and Digitronics.

Underwriters include: D. A. Lomasney & Co., Milton D. Blauner & Co., Michael G. Kletz & Co., Aetna Securities, Stanley Heller & Co. and Ferris & Co.

## SHARES and PRICES

MANY watch manufacturers are venturing into the electronics industry. Reasons are: rapid growth

of electronics and the watch-makers' experience in manufacturing small precision parts.

Five well-known watch manufacturers have made the move.

The electronics products they make include portable radios, miniaturized components automation instruments, gyroscopes, tachometers and other instruments.

Typical Watch Manufacturers in Electronics	Recent Price	1956 Dividends	Percent Yield	Earned per Com. Share		Traded	1957 Price Range
				1956	1955		
Bulova Watch.....	17	1.40	8.2	1.74 <sup>2</sup>	1.79 <sup>3</sup>	NYSE	17½-21
Elgin National Watch.....	12	0.90	7.5	0.74 <sup>2</sup>	1.01 <sup>3</sup>	NYSE	11½-14½
Gruen Industries.....	7 <sup>1</sup>	....	...	<sup>5</sup>	d-2.85 <sup>3</sup>	OTC	.....
Hamilton Watch.....	20½	1.40	6.8	3.98 <sup>2</sup>	4.32 <sup>3</sup>	NYSE	20 -28¼
Waltham Precision Instrument <sup>4</sup> ...	1½	....	...	d-0.02	0.03	ASE	1½- 2¼

<sup>1</sup> bid    <sup>2</sup> fiscal ending early '57    <sup>3</sup> fiscal ending early '56    <sup>4</sup> formerly Waltham Watch Co.    <sup>5</sup> not available

# Local Opinion Counts

It can help or hurt an electronics firm.

Here's how to win friends in town

KEEP good community relations, says George W. Griffin Jr., Director of Public Relations, Sylvania Electric Products, speaking at National Industrial Development Exposition in New York.

Community relations mean a lot to the electronics industry. Many previously small firms have won leading positions in their local communities. But, many have become community newcomers by relocation or by building of branch plants.

There is a dollars-and-cents value in a home community whose services, facilities and social relationships are sound and healthy, Griffin said. There is value in a company being well thought of by the community.

Local opinion can help or hurt politically. It can effect efficiency of business operation and employee morale. Good local opinion has promotional value.

According to Griffin, primary responsibility for good community relations rests with local plant management. Attitude of plant management is the big key.

Plant managers should get into community projects, civic groups, fund drives and hospital work. Employees will follow in reflection of management's attitude. Joint interest and participation of management and employees represents public relations at its best.

Maintaining communications with the community, says Griffin, is an important part of community relations. Building cordial and friendly local press relations is a must. Open-house affairs, plant tours, dedications and ground-breaking ceremonies are of particular value.

---

## MERGERS, ACQUISITIONS and FINANCE

• **Gulton Industries**, Metuchen, N. J., acquires **CG Electronics** of Albuquerque, N. M. CG makes radio control equipment and plans to produce rocket instruments. Acquisition is part of Gulton's broad expansion plan. It expects to announce another acquisition shortly. Gulton expects to make its first public stock offering by year-end. Recently, it privately placed a \$1.4-million common stock issue with a pension fund.

• **Production Research**, Thornwood, N. Y., privately places \$150,000 of 5-percent, 10-year convertible, subordinated notes and 5,000 shares of capital stock, priced at \$9 a share. Placement was made without underwriting to a private group of investors. The firm designs and manufactures communications, infrared and test equipment.

• **Rheem Manufacturing** and the **Solartron Electronic Group** of England agree to set up a jointly owned research and development firm, **Solartron, Ltd.** It will work on radar simulation projects, a multi-headed reading machine and other electronic devices.

• **Epsco, Inc.**, Boston, Mass., completes 60,000-share common stock

issue, offered at \$16 a share. W. C. Langley & Co. headed the underwriting group. Epsco designs and manufactures systems and equipment for use in data processing and automatic control.

• **Ultradyn Engineering Labs**, Albuquerque, N. M., merges with **Straus-Frank Co.** of Houston, Texas. Ultradyn manufactures pressure transducers and other products in the instrument field. The merger provides Ultradyn with capital to improve production facilities and for new product development. Straus-Frank, a manufacturing and merchandising organization in the commercial field, has a net worth of over \$5 million.

• **Ampex Corp.**, Redwood City, Calif., privately places \$5½ million of 5-percent sinking-fund debentures due in 1972 through Blyth & Co. and Irving Lundborg & Co.

• **Miniature Precision Bearings** acquires **Split Ballbearing** through merger. Both firms are in Lebanon, N. H. Diversification opportunities influenced the merger decision. MPB concentrates in the field of industrial components while Split Ballbearing deals largely with aircraft, industrial and automotive

markets. MPB financial resources will be used to provide Split Ballbearing with improved manufacturing equipment.

• **International Glass**, Culver City, Calif., and **Timm Aircraft** merger is approved by stockholders. Timm stockholders will receive one share of International Glass common for each two and two-thirds shares of Timm common. International Glass recently announced plans to expand its electronics activity through a proposed merger with **Cascade Research**.

• **Rek-O-Kut** of Long Island City, N. Y., manufacturer of phonograph turntables and high-fidelity disk-recording equipment, purchases assets of **Audak, Inc.** of New York City. Audak makes phono cartridges and tone arms. It will become the **Audax, Inc.** subsidiary of Rek-O-Kut. Its manufacturing activities will be moved to Long Island.

• **Tung-Sol Electric** registers proposed public offering of 100,000 shares of \$50 par value cumulative convertible preferred stock with **SFC**. Harriman Ripley & Co. is expected to be underwriter for the issue.





*"This refers to yours of the 10th..."*

Some people still hammer out communications one character at a time.

Others use DATAFAX—the fast Stewart-Warner electronic way to transmit all data over standard telephone lines.

Datafax transmits and records any material: correspondence, drawings, pictures, printed matter, even handwritten notes. And since copies are exact duplicate images of the original, chance for error is eliminated.

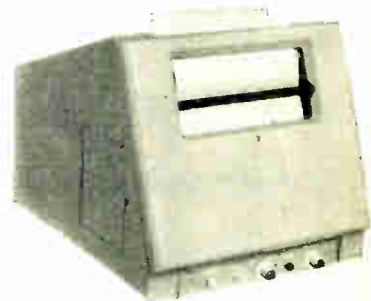
#### Cost?

Automatic transmission and recording eliminate need for full-time operator; recorders will even respond to transmissions sent after the office is closed

for the day. Datafax also eliminates retyping, proofreading, intermediate handling, intransit delays—and their clerical costs. The clear, smudge-proof, permanent Datafax copy costs less than 2¢ for a letter-sized unit, plus pro rata line charge.

Chances are your accounting...inventory control...engineering...production...branch sales...and warehouse operations have outgrown Stone Age Communications. If so, you'll want to find out about Datafax.

First, send for your copy of the free Datafax bulletin. Write: Stewart-Warner Electronics, Dept. 21, 1300 No. Kostner Ave., Chicago 51, Illinois.

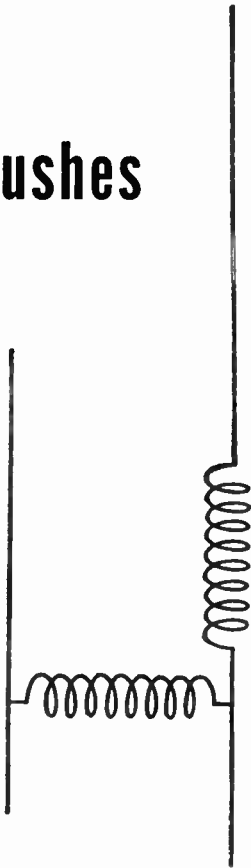


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For more information, write Section 425-7, General Electric Co., Schenectady 5, N.Y., or contact your nearest General Electric sales office or agent.

\*General Electric Trademark for induction voltage regulators.

*Progress Is Our Most Important Product*

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Circle 4 Readers Service Card

## WASHINGTON REPORT

WASHINGTON's drive to hold down military expenditures is taking hold. Most serious cut so far is the cancellation of North American Aviation's Air Force contract for development of the supersonic intercontinental Navaho missile. The 10-year project was still under development when the cut came.

By the time the dust settles, it's figured that the Air Force will have spent at least \$650 million on Navaho. The cancellation decision kills an estimated \$300 million in new business over the coming year—for continued research work, manufacture of prototype models and production tooling.

The Navaho cancellation is the latest of a series of Pentagon decisions to slow down military production. At least eight other major aircraft and missile projects have been stretched out. Defense Department insiders say it's only the beginning. Comments one: "In the past, when we talked of cutbacks to be made, there was a feeling in the bigger companies that this was the usual Washington flak and wouldn't touch them. The Navaho decision gives them something to chew on."

For NAA, which was developing and producing Navaho's airframe, rocket engine and inertial guidance system, the decision means idling some 1,000 electronics workers in the company's Autonetics division at Downey, Calif. (out of a total division work force of 7,200).

In all the pulling and hauling to cut back military expenditures, however, the outlook is still bright for electronics producers. The Air Force still figures on a near-doubling of electronic procurement over the next few years—from a rate of \$750 million in 1956 to an eventual \$1.3 billion.

- Sen. Joseph C. O'Mahoney (D., Wyo.) is spearheading another effort to help electronics producers trim the costs of their patent operations. As chairman of the Senate Patent subcommittee, O'Mahoney has introduced a new bill to allow companies to publish descriptions of their inventions without going through the complex and costly procedures needed to obtain a full-dress patent.

Publication—a form of registration with the Patent Office—is designed to cut down on the number of patents sought by industry for purely "defensive" purposes. For instance, the Patent Office figures that about two-thirds of the inventions patented by large corporations are taken out with no intention of bringing the invention to market. But unless the inventor takes out a patent, a competitor may come along later and patent the same idea, thereby blocking the original inventor from using it.

The huge volume of "defensive" patents taken out as a result, says O'Mahoney, imposes a wasteful burden on industry and the Patent Office. His bill would protect the inventor by making an official record of who actually came up with a patentable idea first.

- The growing role of electronics in military production shows up in the listing of major contractors involved in the Air Force's supersonic B-58 Hustler project, for which General Dynamics' Convair division is weapon system contractor. Electronics manufacturers working on the project include: Sylvania, producer of the B-58's passive defense system; Bendix Radio and Motorola, who are making navigational aids; Emerson Electric, producing the active defense system; Bendix's Eclipse Pioneer division, building the autopilot and Magnavox, producing communications equipment.

# How to have factories in every city...ship United!



Electric motors being loaded aboard DC-6A Cargoliner are checked by United's W. S. Emrich and Reuland's W. L. Johnson (right).

Reuland Electric Co. makes electric motors, many on special order. Reuland's reputation for prompt delivery is known coast to coast. "Our customers couldn't get better service if we had factories in every city," says Reuland's Western Div. Sales Manager, W. L. Johnson. "As it is, the motors are made to order here in Alhambra, California, shipped overnight by United Air Freight."

Shipping United has important competitive advantages for companies like Reuland: wider markets, lower inventory, savings in packaging and insurance. Plus guaranteed space dependability (Reserved Air Freight), door-to-door service, modern cargo handling procedures, round-the-clock flights featuring the world's fastest passenger and all-cargo planes. Ship United!

## Examples of United's low Air Freight rates

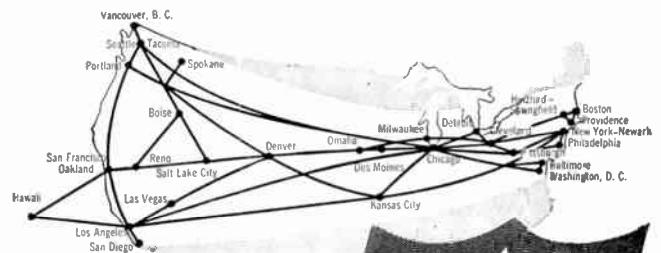
	per 100 pounds*
CHICAGO to CLEVELAND . . . . .	\$4.78
NEW YORK to DETROIT . . . . .	\$5.90
DENVER to OMAHA . . . . .	\$6.42
SEATTLE to LOS ANGELES . . . . .	\$9.80
PHILADELPHIA to PORTLAND . . . . .	\$24.15
SAN FRANCISCO to BOSTON . . . . .	\$27.00

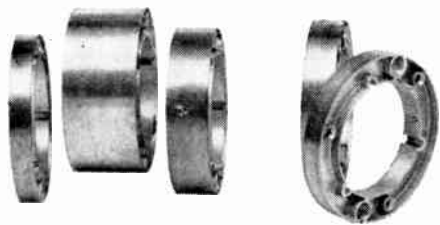
\*These are the rates for many commodities. They are often lower for larger shipments. Rates shown are for information only, are subject to change, and do not include the 3% federal tax on domestic shipments.

### Door-to-door service

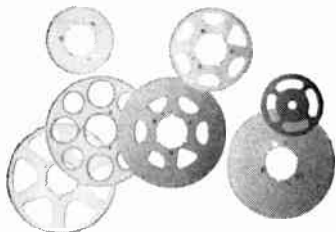
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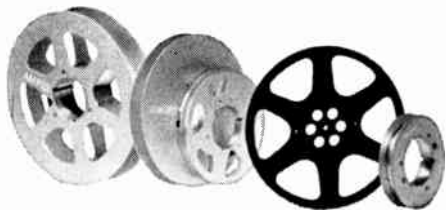




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CUSTOM REELS



**SOLID ALUMINUM HUBS:** 1/4", 1/2", 3/4", 5/8", 1", 2" machined to your required tolerance... intermediate sizes on special order. **ALUMINUM FLANGES:** Off the shelf; dia. 6", 8", 10 1/2", 12 1/2", 14"—.050 and .100 stock... other sizes and designs to your specifications. **PRECISION REELS:** Assembled for your needs from Standard Record components; or designed, developed and manufactured... any size, any quantity... to meet unusual space, weight, operational, or environmental demands.



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manufacturing company  
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## EXECUTIVES IN THE NEWS



### Moore: for Wescon, a sprout of ideas

Snow vice-chairman for Wescon '57 is Norman H. Moore, 39-year-old vice president of Litton Industries and managing director of its electron tube division. The more responsibility Litton piles on the bouncy, enthusiastic Moore, the more energy he seems able to devote to industry affairs. Wescon people point out that he has "literally sprouted ideas" for the show.

Man behind these ideas took an arts degree at Oberlin, went on for a PhD in physics at MIT. The radiation laboratory there kept him for two years on staff; then he went west as research director for Dalmo Victor. Before joining Litton in 1948, he returned for a while to campus life in Stanford's electrical engineering department.

Moore divides his leisure between church and family. Long the finance chairman for Palo Alto's First Congregational Church, he has developed some highly successful fund-raising techniques. "In fact," he says, "the only unique paper I ever wrote was on that subject."

Wife Jean looks more like an Oberlin co-ed than mother of two boys and two girls. She reflects her husband's zest, is an enthusiastic participant in the family hobbies: sailboating, Little League baseball (son Hal plays right field) and snowshoeing.

Moore is a gourmet, too, and a golfer. He seldom breaks 100 on the links, threatens to give up the game if 14-year-old son Dave doesn't stop showing him up.

## STRICTLY PERSONAL

### Help Wanted

We are in the process of revamping our entire reservation machinery. Toward that end, we have asked for proposals from leading manufacturers of data-processing equipment that will help us solve our problem.

Our reservation and space control workload has been growing at a

staggering rate. With the jet age only a year away, we find that our present system will no longer be able to keep pace with the demands that will be placed upon it.

Pan American's general anticipated growth approximates 15 percent for 1957 and from 10 to 15 percent for each of the next five years.

It occurred to me that your pub-

lication might help spread the word of our search and inspire response from any manufacturers that Pan American has not contacted directly.

DANIEL B. PRIEST  
PAN AMERICAN WORLD AIRWAYS  
CHRYSLER BUILDING, NEW YORK

### Tarheel Saga

In reviewing one of your issues, I noted your interesting item concerning North Carolina manufacturing.

You might be interested to know that our firm initiated a manufacturing operation in Fairview, N. C. (12 miles southeast of Asheville) on January 3, 1956.

I believe our employment level parallels or surpasses that of several other major manufacturers in the area.

M. E. PRICHARD  
C. P. CLARE & Co.  
CHICAGO, ILL.

### Cold-Cathode Tubes

With interest, we noted your (*Technical Digest*) item for May 20, p. 19

An error has crept into the text which resulted in several inquiries from manufacturers who were interested in "cold-cathode tubes." The tube in question, type DE2, is not of the cold-cathode variety, but is fitted with a directly heated cathode requiring 12 watts heating power. This cathode is called "E-cathode" . . .

In contrast to the oxide-coated cathode, it has no semiconducting layer on the metallic base. In the E-cathode, the metal is activated by introducing emissive particles into the crystal boundaries near the surface. Furthermore, neither load currents well above saturation limit, nor ionic bombardment, would be able to destroy the active surface. This property permitted the development of the high-voltage (10 kv) rectifier tube type DE2 with a mixed filling of argon and mercury, and an immediate start without pre-heating even at temperatures as low as minus 40 C . . .

EDWARD G. RUIITE  
BROWN, BOVERI & Co., LTD.  
BADEN, SWITZ.

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**KEARFOTT** offers the systems manufacturer the most complete line of precision made components available anywhere. Quantity production enables quick deliveries and reasonable prices.

**SYNCHROS**—Transmitters, Control Transformers, Resolvers, Repeaters, and Differentials in Bu Ord Sizes 8, 11 and 15. High Accuracy and environmental resistance.

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**TACHOMETER GENERATORS**—Available as damping generators, rate generators and integrators. They feature high output to null ratio and extremely linear outputs. Temperature stabilization may be provided.

**GYROS**—Directional, floated rate integrating, free, vertical, and spring restrained rate gyros for all airborne navigation, stabilization or fire control applications.

Bulletins giving physical and technical data of the various Kearfott Products will be sent on request. The Kearfott organization is available to assist in the development and manufacture of other precision components you may require.



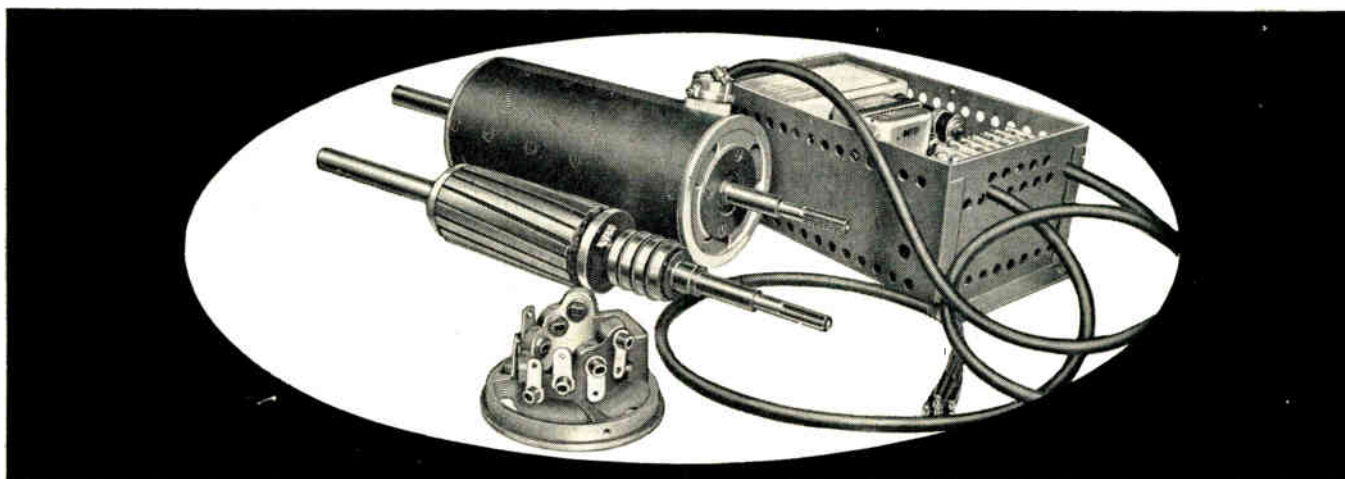
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Case History from the files of the Wincharger Corporation

**problem: COMPLETELY REDESIGN  
AN AIRCRAFT ALTERNATOR  
TO MEET MISSILE WEIGHT  
AND SIZE REQUIREMENTS**

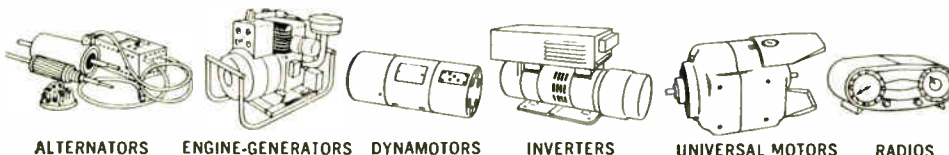


When the Defense Department's missile program went into high gear, Wincharger's Research and Development Group was handed the problem of designing a much smaller, lighter, more compact Alternator. And, along with its smaller size, the Alternator still had to be absolutely reliable.

The happy result was a three-phase, 400 cycle Alternator in an extremely small package that utilized a ram-air turbine and magnetic amplifier regulator. The Wincharger-designed Alternator proved completely satisfactory in actual use.

If YOUR work requires special purpose Alternators, Inverters, Dynamotors or other Power Supplies, bring your problem to Wincharger's Research and Development Group. Their extensive experience in solving problems in all phases of these fields is your best assurance of a workable solution.

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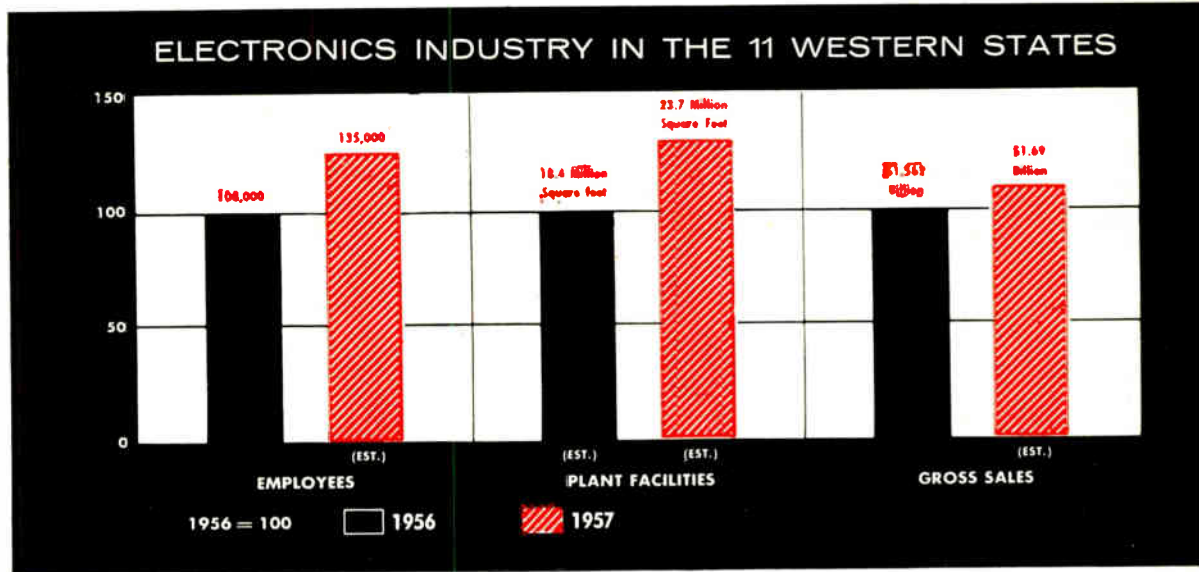


**Specifications**

- Air-turbine driven.
- Output Voltage . . . . . 3 ph. 115/208 volts, 400 cycle, 600 watts.
- Temperature Rise . . . . . Minus 54° C to plus 74° C.
- Static Temperature . . . . . Minus 46°C to plus 55° C.
- Running Duty . . . . . Continuous.
- R.P.M. . . . . 8,000.

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## Wescon Marks Growth in West

- West Coast manufacturers figure their 11-state area makes a fourth of the industry's gross sales and is still growing
- Their big show and conclave, Wescon, will fill San Francisco's Cow Palace next week. The show is still growing too

ELECTRONICS is big business in the West. And despite recent Defense Department cutbacks, the industry shows every promise of continuing to grow lustily in the western climate.

Last year, according to West Coast Electronic Manufacturers' Association, the eleven western states claimed 15 percent of the nation's electronics firms, employed 17 percent of electronics workers, and racked up 24 percent of total industry gross sales. This year, WCEMA is confident that the West will bite off—and chew—a still bigger share.

The concentration of the electronics industry on the Coast in Los Angeles and neighboring Orange County, is being rivaled by other growth areas in the West. The San Francisco Bay and peninsula, San Diego, the Valley of the Sun in Arizona, and the Portland-Seattle region are all coming along fast.

WCEMA spokesmen expect the San Francisco area alone to increase its plant capacity by 50 percent

and its sales by 41 percent this year. Electronics employment on the peninsula should rise 33 percent over 1956 levels.

The booming Bay area comes under an especially bright spotlight this month. From August 20 through 23, some 30,000 technical and business representatives of the electronics industry will pack San Francisco's Cow Palace for the Western Electronics Show and Convention (Wescon).

Wescon, nine years old this August, is suffering from the same kind of growing pains that plague and please the area it serves. Last summer, three circus tents were needed to catch the overflow from the 100,000-sq ft Pan-Pacific Auditorium in Los Angeles. Next week the Cow Palace—largest convention hall on the Coast—will bulge at the seams with 765 exhibits and six lecture halls.

The 30,000 expected convention-goers represent a 20 percent increase over last year's attendance. In

48 technical sessions, they will hear some 225 papers. Lecture halls to hold the sessions were partitioned off the Cow Palace floor, putting exhibits and technical sessions all in the same building.

It'll be physically impossible to take in all the sessions, exhibits and field trips that are planned. If a visitor could contrive to be in several places at one time, he might:

- Watch construction work on the atom-powered Regulus-armed submarine *Halibut* at Mare Island Naval Shipyard.
- Witness simulated target acquisition, tracking and firing at one of two Nike posts.
- Learn firsthand about effects of atomic radiation at Navy's Radiological Defense Laboratory.
- Trudge through a double handful of the various electronics plant facilities and major installations in the Bay area.

• Peer into radio telescopes, wind tunnels and bevatrons at Stanford University, Ames Aeronautical Labs and the University of California Radiation Lab.

Social events, as usual, will give a lot of people a chance to backslap and talk some business. Wescon has scheduled a breakfast for distributors and reps on Thursday morning, Aug. 22.

Army secretary Wilbur M. Brucker will discuss the role of electronics in Army's long-range research effort at the All-Council luncheon given Aug. 21 by WCEMA. Featured speaker at the All-Industry luncheon at the Fairmont Hotel on Friday will be Major General Bernard A. Schriever, chief of USAF's Ballistic Missile division.

The convention committee has also made plans to keep itinerant but nontechnical wives busy and happy during the show's four days. The Future Engineer's Show (Wescon Jr.) will give sons of registrants and other youths a chance to participate.

## SOME PAPERS TO HEAR AT WESCON

*For a preview of the Wescon technical sessions, ELECTRONICS sent Pacific Coast Editor Hood to query Dean Watkins of Stanford University, who is chairman of the technical program committee for Wescon '57.*

**Hood:** Dean Watkins, what in your opinion are some of the highlights of this year's Wescon?

**WATKINS:** The first one that comes to mind is the evening session on controlled fusion research. It will be a one-paper session by Herbert York of the Livermore Lab. Dr. York will emphasize the electronic aspect of fusion and means for physically containing it.

Also the session dealing with solid-state microwave amplifiers. These devices may make possible direct detection of thermal radiation in the microwave range from trees, buildings, aircraft and so forth. In my opinion this is the most significant development being reported at Wescon this year.

There's to be a session on military electronics. Several representatives of the Defense Department will play up their ideas on the importance of research.

**Hood:** Is this the aircraft vs missile controversy?

**WATKINS:** No, it's more concerned with the role of basic research. Secretary Wilson says that the Defense Department doesn't need to spend money to find out what the other side of the moon looks like. These people

from the services will ask for increased support of long-term research out of the Defense budget.

**Hood:** Will there be much emphasis on reliability?

**WATKINS:** There's a session on reliability and quality control. It's certainly an item of continuing importance.

**Hood:** Transistors?

**WATKINS:** Two sessions on transistors, one paper covering a 10-mc 5-watt transistor which represents a considerable advance in the state of the art.

**Hood:** What will it mean, specifically?

**WATKINS:** Wider bandwidth and higher power output should mean efficient video and pulse amplifiers.

**Hood:** How about medical electronics?

**WATKINS:** One session, not too revolutionary. Two noteworthy papers on use of linear accelerators in therapy.

**Hood:** Of course there's something on airborne electronics.

**WATKINS:** Yes, a session on electronics in high-speed flight, sponsored by IRE and the Institute for Aeronautical Sciences. I think it'll be a good coverage of what's new in airborne electronics.



# Shift to the Commercial

**Some 20 electronics firms, all heavy on military side, are making a concerted effort to get into or enlarge their places in the commercial market. One of these companies plans move into nuclear energy field, medical electronics and special-purpose computers**

EXPLAINING a major business policy move, Ford Instrument v-p and general manager Charles Rockwell drew upon an ancient but precious truth. He said, "Don't put all of your eggs in one basket."

Recent cancellation of the Air Force Navaho guided missile contract is an example of the thing that has electronics firms asking themselves "What percent should we be in military work and what percent in commercial?"

Ford, since it was organized in 1915, has been almost exclusively in military production business. Not shaking off this business as its primary interest, Ford looks to add on products in the industrial and commercial field.

**This move represents a major trend in electronics. In the past few years some 20 companies, heavy on**

**the military side, have taken organized steps to get into or increase position in the commercial market.**

General Precision Laboratories credits commercial-consciousness for stepping into closed-circuit tv field. GPL is now considered one of major firms in cc-tv.

Airborne Instruments in 1956 expanded its commercial products line under an organized effort. It credits new products Automatic Noise Figure Indicator and Airtone Automatic Announcing System for elevators to its program.

In the last two years each of these companies set up committees composed of top management in engineering, manufacturing and sales. Job outlined for the group: uncover new commercial products, find commercial uses for military products.

Name of these committees, oddly enough, is the

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## TECHNICAL DIGEST

- Transparent radar reflectors are achieved by vacuum deposition of metal on glass or on stable polyester-type plastics by Sierracin Corp. Resultant coating is conductive (5 to 20 ohms per sq in.) and will withstand a heat output of several watts per sq in. for anti-fogging applications on meter windows, aircraft windows and helmet visors.

- Microwave refractometer, small enough for installation on single-engine light planes, has resonant cavity arranged to sample air during flight. Resonant frequency of cavity, a simple function of refractivity of air, is compared with that of reference cavity and resulting phase difference is recorded as data for tropospheric radio propagation research. System was developed by NBS Boulder labs for U.S. Army Electronic Proving Ground at Fort Huachuca, Arizona.

- Movement of pill-shaped Alnico permanent magnet through stomach of patient is traced with Waugh magnetometer at UCLA to study effects of emotional disturbances. Polystyrene coating on magnet gives same feel as vitamin capsule. Amplified output of magnetometer coil under patient is fed into chopped input of Offner electroencephalograph connected to recorder which shows mode, orientation and periodic amplitude of magnet movement as well as position.

- Selector switch speeds of over 300 contacts per second are achieved with one-motion rotary selectors developed by Philips (Holland) for automatic telephone exchanges. Unique wiring scheme reduces contact wear, eliminates home position yet gives same average wiper travel distance per call as with ordinary two-motion switch that has ten 10-contact decks. Continuously running drive motor

actuates wiper through coupling and stopping magnets.

- Proton precession magnetometer developed by Varian Associates for Project Vanguard satellite weighs only 4½ lb (batteries 1½ lb, transistorized electronics 1 lb and coil-in-kerosene sensing head 2 lb). Unit will provide time record of earth's magnetic field above ionosphere for telemetering to ground stations.

- New frequency meter provides record of instantaneous values of power-line frequency. Synchro automatically positions small auxiliary motor with respect to three-phase, two-pole asynchronous motor connected to line being monitored. Thus difference between line frequency and that of tuning-fork standard is proportional to movement of small motor on slide. Meter was developed at Electro-technical Institute of Rome University.

same in each company. Each was called "The New Products Committee."

"Our interest in the commercial market was evolutionary," says Rockwell of Ford Instrument. "It was the evolution of our ability and the evolution of the market. The two came together."

Ford "first touched base" in recognizing the evolutionary marriage when it worked on controls for the nuclear submarine *Seawolf*.

It sees instrumentation and control in nuclear field as a broad avenue into the commercial field. "The nuclear revolution is the biggest thing that ever happened to business and American life. It requires the type of talent electronics companies have. It requires great precision and reliability. Those two qualities are our stock in trade."

An outside request took the company into medical electronics. Ford began developing a piece of elec-

tronic equipment to serve as an intrinsic part of surgical operations on a detached retina of the eye.

**Peering further into potentialities of medical electronics, company study was made. A 24-page report on applications is the result.**

Another study is under way in data-processing. "Whereas there are a number of companies making excellent big computers, there seems to be a large enough demand for specially designed special-purpose computers to devote some time and effort in this area."

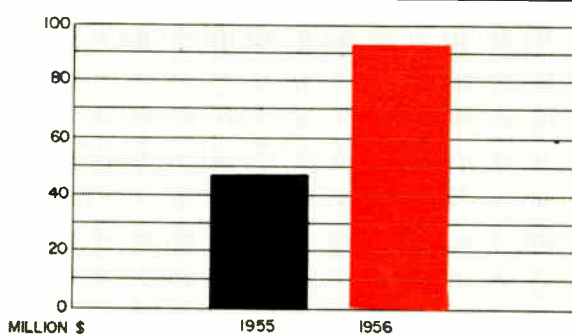
Caldwell feels that Ford "will always be predominately military. There's no definite objective. There's no timetable. We're proceeding cautiously."

"We're looking to the day when there's no cold war. It makes sense to us if one well might conceivably dry up, to have another going strong."

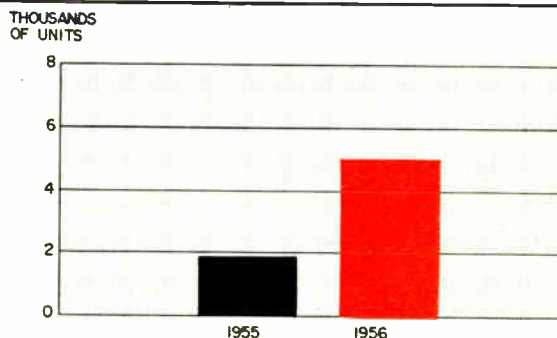
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## PRODUCTION and SALES

VALUE OF COMPUTER SHIPMENTS



NUMBER OF COMPUTERS SHIPPED



SOURCE: BUREAU OF CENSUS

## Computer Shipments Double in '56

ELECTRONIC computer shipments in 1956 were double the value of 1955 shipments according to a Census Bureau report released last month. Value of shipments totaled \$94 million in 1956 compared with \$47 million in 1955.

Number of computers shipped last year was nearly three times the 1955 level. Some 5,120 computers were shipped by manufacturers in 1956 compared with 1,916 in 1955.

Greater rate of increase in units shipped reflects increasing interest in small and medium-size computers. On the average, 1956 prices were 25 percent less than the pre-

ceding year. Computer prices averaged \$18,400 in 1956, down \$6,100 from the 1955 average.

Census figures on value of shipments for 1956 differ only slightly from sales of \$100 million for the same year, reported by EIA. However, for 1955 the Association reported computer sales of \$72 million while Census reported a much lower shipment figure of \$47 million.

Difference can be explained by fact that Census shipments include only computers shipped but do not include computers sold during the current year for shipment

within the next few years.

Dictating machines, also included in Census report on Office, Computing and Accounting Machines, are becoming a sizable item of the electronics business. Value of shipments in 1956 totaled \$28.3 million, 30 percent more than the \$21.8 million of dictating machine shipments in 1955.

Number of dictating machines shipped in 1956 totaled 137,700, about 40 percent more than the 97,100 machines shipped in 1955. However, these figures also include transcribing, record shaving and recording machines.

# Plants Become Grad Schools

**In-plant engineering education is spreading as more companies discover that it helps recruiting while it upgrades existing staff. West Coast firms see graduate training a competitive must; they offer a variety of courses tailored to suit individual and company**

A CREWCUT engineer carries his sliderule to a University of Southern California class once a week to earn his M. S. degree. Nothing unusual about that except that he earns his credits at the Northrop Aircraft plant where he works.

Four in-plant classes are provided for Northrop engineers in a long-range cooperative program with USC. University instructors teach 120 engineers in after-hours classes. Company pays tuition.

Investment in post-graduate education pays double dividends for sponsoring companies. Personnel directors get a potent engineering recruiting tool. Training also upgrades existing staff, helps the company get more mileage out of its engineering department.

A recent survey shows that recruiting cost per engineer may soar as high as \$4,579. Applied toward a neophyte engineer's graduate program, this amount goes a long way. It also betters the company's competitive situation in recruiting.

Post-graduate programs take many forms. Grants and application prerequisites vary, but all courses must line up with company interests. Otherwise there are no strings attached. Firms seek no guarantee that students will continue with them after getting advanced degrees.

Educational budgets are large, but aid is usually not advertised. During interviews job applicants are told of facilities offered.

A spokesman for the college viewpoint, Joseph M. Pettit of Stanford says employer cooperation is one way to lick engineer shortage. He believes graduate students' greatest need is for financial support. Industry can aid with scholarships and/or work-study programs. Here are a few examples:

Stanford participates in an honors cooperative program in electronics with several San Francisco Bay area firms. Selected graduate students work 35 hours per week in a participating company and get full pay. Students carry a 40 percent load at Stanford and can earn a master's degree in two years.

In Los Angeles, Hughes' Aircraft fellowships pay graduate students tuition and expenses, plus part-time salary and, for doctoral students, a generous

living allowance. Most applicants are recent graduates. They are chosen on ability, past scholarship, and financial need.

At North American Aviation students get a two-thirds refund on tuition when satisfactorily completing courses. If working toward a degree, the remaining third is granted when diploma is earned. Post-graduates may also take 11-month leaves without pay, alternating with one-year full employment.

Lockheed missile systems division sponsors an advanced studies program at all plants. The project helps students working toward Masters' or higher degrees. Recruits study full time and work half-time, getting pay for 40 hours.

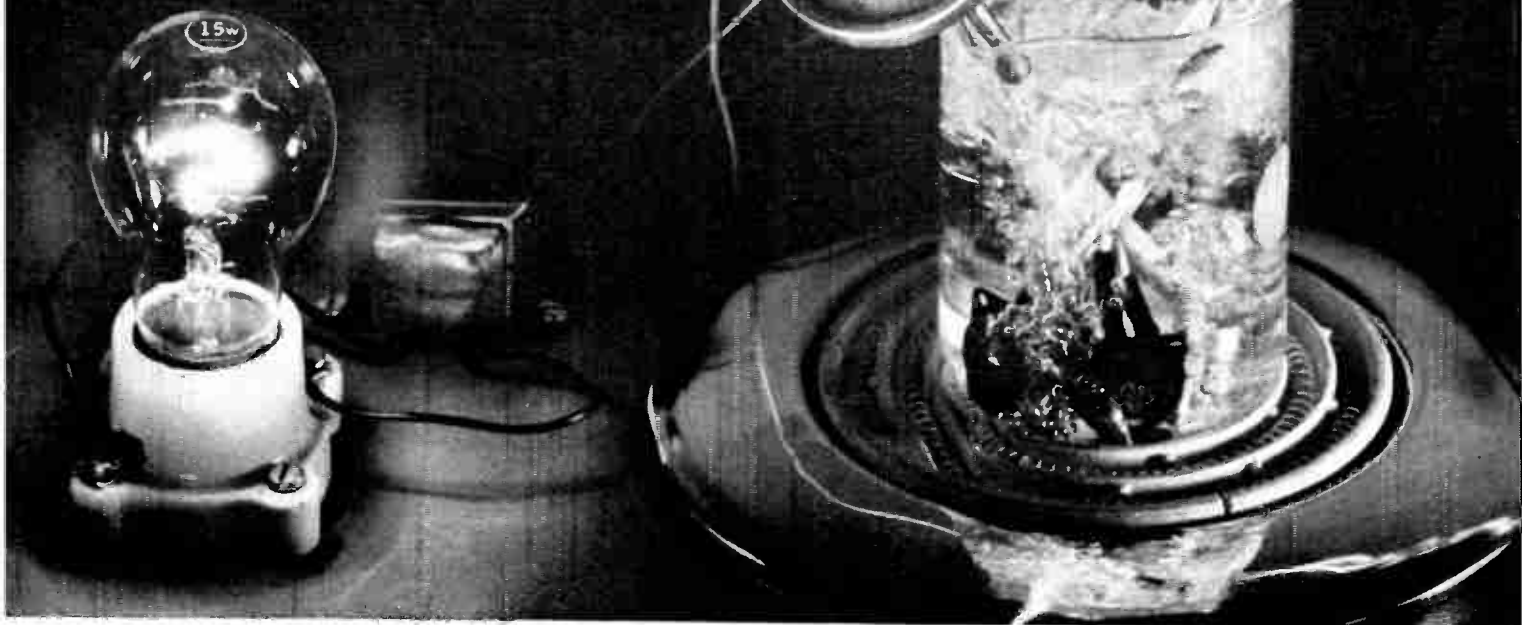
Douglas employees going to school half-time or more work at least half-time. They are paid for time worked, plus 40 percent of out of pocket expenses, including salary loss, tuition, and books. Students must send grades to company scholarship board twice a semester.



## Coming Home to Roost

Navy's new air-to-air guided missile, Sparrow III, is intended for use by fighter aircraft in Fleet Air Defense. Developed by Raytheon, also prime contractor, improved missile will augment Sparrow I. Sparrow III is semiactive missile, launched under guidance of mother ships, carriers own homing unit

SILICON  
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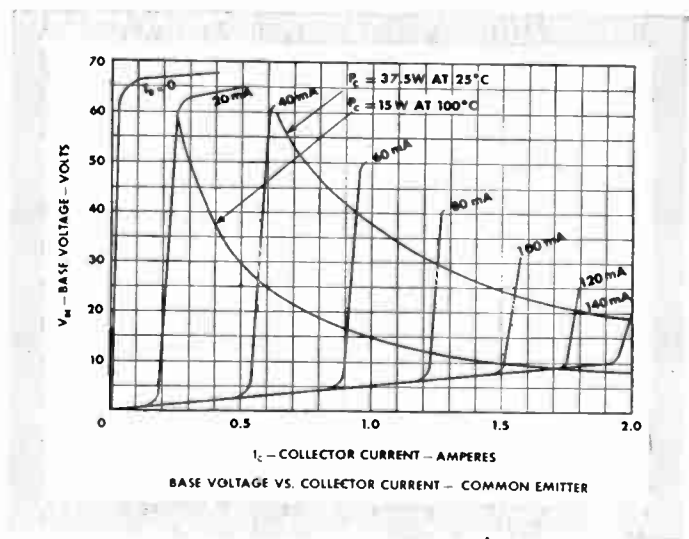
now you can get

# 15 watts at 100°C



## NEW silicon high power transistor

For your audio servo uses — and many other applications, you can reach new transistor highs — in power, temperature and gain with low distortion and the stability and reliability you expect from silicon transistors. In Class B push-pull operation, two new TI Type 2N389 silicon diffused junction transistors provide 15 W power output at 100°C ... with distortion of less than 10% and typical beta cutoff frequency of 300 keps. This new transistor is the first high power silicon transistor and the latest addition to the TI silicon line ... widest in the industry.



### absolute maximum ratings

Power Dissipation at 100°C	15	Watts
25°C	37.5	Watts
Collector to Emitter Voltage	+60	Volts
Base to Emitter Voltage	-2	Volts
Collector Current	2	Amperes
Saturation Resistance	6	Ohms
Base Current	0.5	Ampere
Storage Temperature	-65 to +150	° C

visit our booths  
no. 3001, 3002, 3019, 3020  
at the 1957 wescon show



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# Researching for Profit?

- Laying out money for non-profit institute research more than doubled one firm's income in six selling years
- Institutes provide a complete research tool kit; They can work bugs out of a device or make a comprehensive market report

NONPROFIT research institutes spend about 66 million profit-motivated corporation dollars each year on research.

That's two-thirds of the amount U. S. firms spend on all outside research, says the American Institute of Management.

This year hundreds of research-conscious firms are calling on nonprofit institutes both for scientific trouble-shooting and long-range planning. Insofar as the institutes affect the ability of a product to compete or the development of a new product, they affect profits.

Their work ranges from exploratory investigations to new-product development. It covers technical-economic services in areas such as marketing, production, information and research management.

Firms that have contracts with institutes range from one-man companies to giants of the electronics industry that have well-established research laboratories of their own.

Battelle Memorial Institute of Columbus, Ohio, spends about \$2 million on electronic research alone out of a \$20-million annual research budget.

Battelle estimates the average electronic project for one year amounts to some \$20-\$30,000.

Sponsoring firm holds the stopwatch on length of time for project completion. This can mean a six-month crash program or one that is renewed year after year.

Studies in the semiconductor field are one example of what Battelle calls directed basic research, aimed at opening up, technologically, new fields for business.

How institute research can be turned into profits is shown by the case of The Haloid Company of Rochester, N. Y.

Battelle had engaged in unsponsored research in xerography, an electrostatic dry-printing process that uses ordinary paper and plastic powder. Electronic power supply furnishes required high voltage. In 1948 Haloid signed a contract with Battelle to develop the process.

First xerographic equipment was marketed in 1950 when Haloid was a \$10 million-a-year company. Last year Haloid reached \$23.5 million; it attributes most of this gain to xerographic equipment sales.

Some advantages of institute research are:

- Help from a competent and diverse staff of specialists, which the company could probably not attract or afford to hire.

- Use of expensive scientific equipment without large investment of capital.

- Prompt study of research problems too complex for or outside the regular experience of the company and its research staff.

Some advantages for large concerns are:

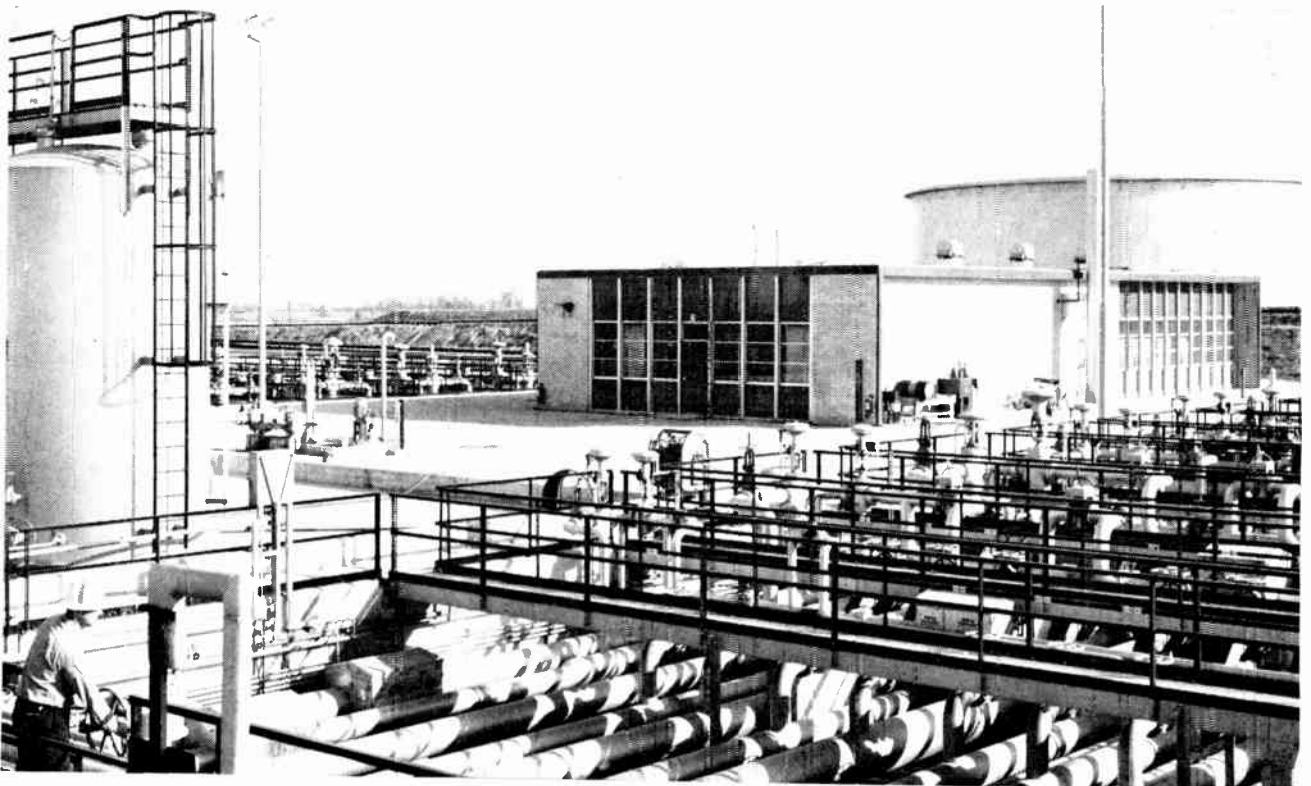
- Avoidance of extra personnel and equipment costs for a special project outside the regular research program.

- Confirmation of research data prior to heavy investment.



## Handling Hot Stuff

While one man stands guard with radiation counter, other lowers uranium slug into core of nuclear reactor at Atomic International Division of North American Aviation



Control rooms house \$1-million system where . . .

## Tubes Control Refining

Tidewater Oil Company's new \$180-million refinery contains a \$1-million electronic information control system to log or record process variables. The system continually scans 4,000 points, logging routine signals and sounding an alarm whenever an out-of-tolerance measurement is detected



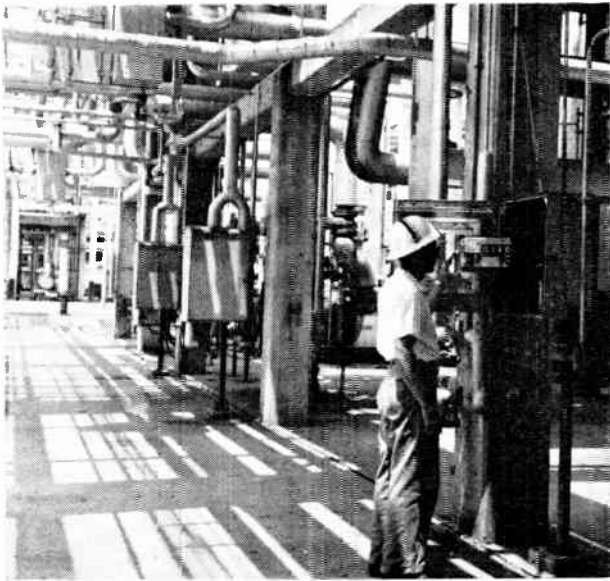
Process variables are compared on trend recorders

ONE of the country's newest oil refineries is Tidewater Oil's Delaware plant. It cost \$180 million and contains, the company says, more electronics than any yet built.

Like other recently constructed refineries, Tydol's plant processes oil "in-line". It has one each of the various kinds of processing units. The setup is extremely efficient, as long as all of the units in the processing chain keep operating.

"We needed an information control system which would nip trouble in the bud," an official explains.

What nips trouble in the bud is a \$1-million electronic data scanning and logging (or digital recording) system. This is leased from Panellit, Inc., which also installed and maintains the plant's pneu-



pH meter monitors oil composition

matic and electrical instruments and controls.

Actually, the information system is 13 complete systems housed in 9 control rooms—one for each operating unit.

The electronic systems continually scan 4,000 signals telling temperature, pressure and flow. The systems convert the signals to digital values.

Operators get an hourly log of process variables or a running record on graphical trend recorders. Any logged reading can be obtained at any time on a plug-in digital indicator. A daily summary is taped for business machines.

Between hourly logs, any off-normal signal is printed in red and an alarm sounds. Tydol believes this is the most important function of the informa-



Scanning circuits feed analog-to-digital converter

tion system because "between hourly logs a refinery can get into a lot of trouble".

Manpower savings were a secondary consideration, although the system probably saves 25 men and one-fourth the control space required for manual logging.

Tydol could have gotten one scanning system rather than 13. But since this would place the burden on one man, it was not considered.

One million dollars sounds expensive, but it isn't because potential savings in operating costs are large, comments James McDonald, assistant refinery manager.

The scanner's warning feature, he explains, enables the unit to be pushed closer to maximum efficiency and ultimate capacity—130,000 barrels daily.



Data logger (front), indicators tell what's happening



Engineer spot-checks oxygen analyzer



Tape captures jet's vibration as . . .

## Data Recording Rides High

- Growing industrial and military demand for more and more data pushes recorders into multimillion dollar business
- Aircraft and missile industries make up 67 percent of the market. Research takes a 20 percent share

INSTRUMENT-TYPE magnetic tape recorder-reproducers have become a multimillion-dollar electronics market in less than a decade. The reason is scientific and industrial need for high-speed, high-volume ways to get, keep and use data. Right now, industrial automation and missile testing are giving the boom an added push.

Instrument recorders share basic operating principles with familiar home and business types as well as those used to record tv pictures and motion-picture sound. The primary difference is in versatility.

To meet scientific needs, instrument-type recorders have a wide range of frequency response, signal sensitivity, tape speed, modulation and coding methods. Building-block construction often allows changing modulation methods. Instrument-type recorders are not concerned with sound so much as temperature, acceleration, pressure, flow, shock and vibration.

Electronic and mechanical refinements push prices of some instrument recorders to five and six figures. Few home recorders are priced over \$1,000.

Aircraft and missiles are a prime market for instrument tape recorders. One firm, Ampex Corp., reports these percentage sales: aircraft, 67; miscellaneous research, 20; communications, 4; machine tools, 3; computers, 3; medical, chemicals and others, 3.

New aircraft sometimes demand more than a million measurements in a test flight. A single re-

corded B-52 flight has resulted in more measurements than all the tests made on the World War II B-17.

Gathering data in volume, aboard test aircraft or from missile-range telemetry receivers often requires recorders equipped to take coded and multiplexed signals on 14 or more tracks.

But it is in playback and data processing that magnetic tape really earns its salt.

Taped measurements are readily fed into computers, automatic wave analyzers and other electronic equipment. Answers can be obtained in hours or days rather than weeks or months manual methods sometimes require.

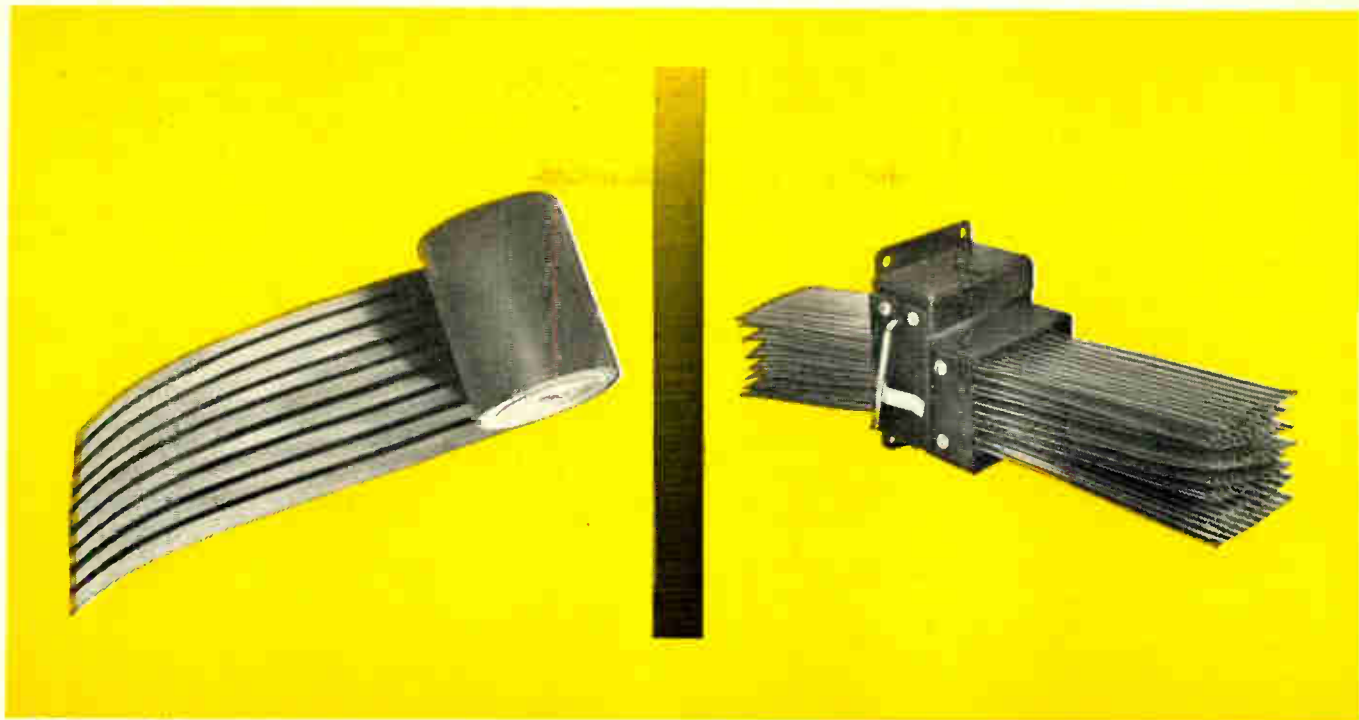
Recorder-reproducers for instrument data processing took in about \$250,000 in 1952. This year, estimates Davies Laboratories division of Minneapolis-Honeywell, sales will be \$12 million in this one field.

Tape also can recreate physical phenomena. The vibrations of a plane in flight with guns firing, for example, can control a shake table testing airborne gear on the ground.

Magnetic tape is comfortably at home in computers, supplementing internal memory, helping in information sorting and readout.

One computer firm, making its own tape transports, expects to put two to six in each computer. A tape transport maker estimates current annual market at \$3 million.





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# Microwave Debate On

FCC takes first look in twelve years at microwave rules. Effect of possible decision will be presented by RETMA

IN WASHINGTON, D. C. at FCC headquarters a decision is in the making which one equipment maker thinks, "could balloon microwave business into the billion-dollar-a-year category."

This estimate may be overly optimistic, but it reflects the almost boundless enthusiasm manufacturers have about microwave.

Commission is taking its first look at the 890-mc and up part of the spectrum in twelve years. The important question is "how much of the microwave part of the spectrum will be open to private users?"

A parade of private users and potential private users are testifying to the advantages of putting the private label on more microwave space.

Southern Regional Education Board, representing sixteen states, proposes to construct a microwave system interconnecting a regional educational tv network if the Commission widens private space. The Board plans to spend \$204 million on it.

Two sets of figures will be placed in evidence, probably sometime in September, which will indicate microwave-equipment-maker feeling about the decision. RETMA (now called EIA) will make comparative projections of microwave business for the next ten years with rules unchanged and with relaxed restrictions on private space.

Although figures are unavailable until presented to the FCC, it is understood that both sets will indicate substantial growth. The first set will be modest in comparison to the second.

Regardless of growth potential of microwave equipment business, it is booming today.

According to one company, 1956 saw microwave equipment sales add up to \$25 million, exclusive of sales to AT&T. Another company estimated it at \$17 million. Still another said: "First is too high and

second is too low. We'd hang it up around \$20 million exclusive of Bell."

In 1950, microwave equipment sales were less than \$1 million, outside of AT&T.

Climb is continuing. Each day new systems are announced. RCA is setting one up for Texas Gas Corporation for 700-mile pipeline jump across Southeast's Big River Region. Philco is installing one for West Virginia Turnpike. GE is putting in one for Indiana Toll Road. Collins is putting in a \$3-million 22-link system for Civil Aeronautics Administration.

Atomic Energy Commission is asking for bids for a complete two-terminal multichannel microwave system at Richland, Wash.

## CC-Tv Enters Plant Relations

LARGEST market for closed-circuit television, thinks Lloyd G. Hallamore, president of Hallamore Electronics, Anaheim, Calif., is in employee communications.

This conclusion was underscored on a sun-baked day this spring as he stood in front of a parking lot packed with his 1,200 employees. He was trying to explain a company policy.

First result of that meeting was the decision to install cc-tv in his own plant, making unnecessary any more parking lot gatherings. Second was to introduce on the market a television broadcasting studio package costing \$14,000 to solve same problem for other companies.

The package contains audio and video console control, film and slide equipment, turntables, vidicon camera chain.

In the same vein, Hallamore has in the works what he calls a tv twx system. He is arranging to hook up all the ballistic missile plants in

Southern California so that executives of each company can see and hear one another in project discussions.

Other markets the firm sees for its studio package: community antenna system hook-ups for live programming, standard telecasting (to take care of late film and test patterns), wired pay-tv setups and low-cost telecasting facilities for nations in the Middle East interested in getting in the tv swim cheaply.

## Charge Engineer Manpower Waste

"ENGINEERING MANPOWER is being wasted to a considerable degree at the present time," concludes a Harvard Business School study, released last week.

The study, *Engineering Manpower—How to Improve its Productivity*, was prepared by nine Harvard Business School students under the guidance of George F. Doriot, HBS professor and president of American Research and Development Corp.

It is based on personal interviews and correspondence with industrial executives, engineers, union leaders and university and government officials.

In many large, and most medium and small-sized companies, little conscious effort has been made by management to improve and maintain the level of engineering productivity, the authors say. Compared to management accomplishments in improving effectiveness of sales and production manpower, much less has been accomplished in engineering.

Many companies find it hard to improve their engineering productivity because nontechnically trained executives often seem to be out of touch with the problems and requirements of engineers, the authors find. Moreover, even some technically trained executives sometimes resist changes that could increase engineering productivity.

Before management can solve its problem of how to more effectively utilize engineering manpower, it must gain a more thorough understanding of its engineers, the authors conclude.



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# Lease-Back Frees Cash

It's not something for nothing, but it's a method to free capital and defer taxes. Lease-back plans stress test instruments

CAPITAL tied up in test equipment can be freed by new instrument lease-back plans. Here's how they work. An electronics manufacturer buys test equipment, sells it to one of a number of leasing firms, then rents it back.

Lease periods run as long as 10 years, with most averaging three to five years. The plan also postpones payment of taxes. This too adds to working capital.

As Trevor Ternan, president of the Los Angeles firm of Ternan, Clauson and Co., explains: "By deferring the payment of taxes until cash profits have been earned, more working capital is provided. This results in additional cash profits." Another advantage: leasing can be used to group instrument buying into specific contract periods.

Companies offering plan agree on one prime advantage: badly needed test equipment may be had without freezing working capital.

The West Coast's United States Leasing Corporation offers one ver-

sion of the basic lease-back plan.

"We'll buy the equipment you select from the manufacturer of your choice at the price you have agreed upon. Once the master lease plan has been written for your firm, you can add equipment to the basic lease as required." USL's minimum lease is for \$2,000 of equipment.

Western Scientific Instrument Co. of San Carlos, Calif., adds this twist. It will pay cash for your entire complement of test gear. But while you're renting it back, you get a complete maintenance program.

Manager J. H. Dobrin points out: "Experts periodically inspect and calibrate the instruments." Maintenance feature frees technical people for their principal duties such as design.

Generally, Western's customers can declare instruments obsolete any time after the first nine months. The average Western client uses between 1,000 and 1,500 instruments.

# Profit Sharing Grows Popular

Last week a young electronics tech, 25, married, two children, joined Consolidated Electro-dynamics' profit-sharing retirement fund. What he sees in the future: a retirement fund of more than \$70,000.

Giles Hall, director of personnel at Consolidated, sees as advantages for the firm: a feeling of participation in the company's progress, interest in reducing waste, accidents. Beckman Instruments' spokesman says profit-sharing systems serve basically to attract and retain top-flight employees, and to allay any fears of old-age insecurity.

Ampex set up its system after 200 plans were studied by an employer-workers committee. The company contributes 15 percent of its net profits (before taxes). Employee contributions are voluntary

and may range from a minimum of 2.5 percent of base pay to a maximum of 10 percent.

The worker may withdraw 100 percent of his contribution when he pleases. Twelve months after signing up for the plan he may, in case of emergency, withdraw 50 percent of the amount Ampex has put in to his account; 100 percent in 24 months.

Other companies' plans are basically the same. Variations are mainly in details. At some companies, however, only the firm puts money into the fund.

None of the electronics industry's profit-sharing systems have been functioning long enough for retiring workers to get into the real money yet. But for today's new employees the future looks safe, and loyalty pays off in five figures.



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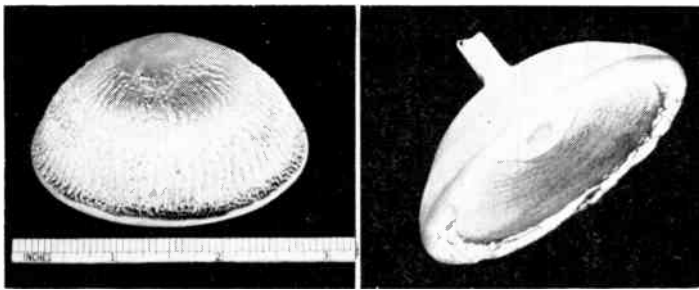
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Sapphires assume odd shapes . . .

## Making Missile Noses

Work continues on 7-in. synthetic sapphire nose-cones for infrared guided missiles. Sapphire windows find use in electron tubes

FUTURE infrared-guided missiles may have single crystal sapphire nose domes as big as a schoolboy's beanie.

Late last month, Linde division of Union Carbide reported it had nailed down a technique for five-inch flat window disks and was planning volume production.

Production of the 3-inch diameter disks has become routine in the past year at Linde. Experimentally synthetic sapphires have attained 5.5 inches diameter. Infrared engineers are now asking for 6 and 7-inch domes. More area means more sensitive infrared pickup.

Sapphires are in demand for rugged military and industrial applications because they combine transmissions and physical characteristics available in no other commercially produced substance.

The gem-like crystals give 90 percent transmission up to four microns wavelength, 50 percent at six microns at temperatures of 500 C and up. The gems are next to diamond in hardness and remain rigid at 1,800 C.

Synthetic sapphires are also used as windows for klystrons, magnetrons and tri tubes. The stuff has no pores, which prevents outgassing problems, and dissipates heat fast. Its dielectric strength is 480,000 volts per centimeter, equivalent to sintered alumina. The cost? A one-inch window is \$15, and 3-inch window \$135.

Sapphire tubes and rods are also used as spacers for electron-gun assemblies and as radiation pipes. The pipes link temperature measuring instruments to such things as semiconductor crystal-growing furnaces which must maintain high, but stable temperatures.

While instrument and watch-making industries use 50 to 60 million jeweled bearings annually—1,000 or more ride in a fighter plane—however only a fraction of these are made in the U.S. American makers often cannot meet European prices for common shapes, but excel in specialized production.

## Flat P-C Cable Changes Designs

CO-PLANAR cable suited to printed circuits and automatic production is being placed on the market by a new firm, Tape Cable Corp., of Rochester, N. Y.

Flat copper conductors are imbedded parallel to each other in thin, highly flexible polyester film. Total thickness is 0.008 inch. Conductor spacing of 0.10 inch center-to-center conforms to RET-MA-recommended printed-circuit grid pattern. Rating is 300 volts.

Tape Cable claims these advantages for the new cable:

- Since all conductors are pre-positioned in the polyester insulation, the cable can be handled as

a single wire. Using holding jigs, the cables can be stripped, spliced, dip-soldered and joined to mating conductors or printed-circuit connectors as a unit.

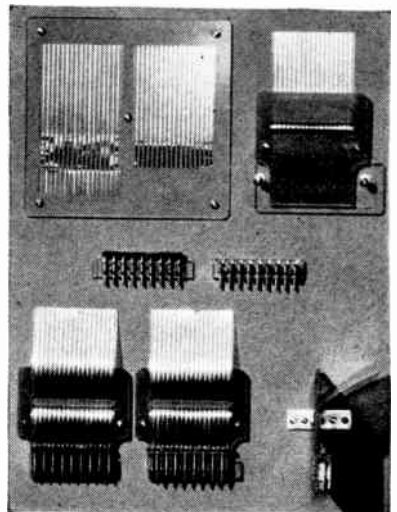
- Using flat conductors and integrated insulation saves space and weight. A square-inch cross section will contain 1,160 conductors, compared with 225 conductors for round wire cable.

- It is suited to high-frequency applications because flat conductors dissipate heat better and the inter-conductor capacitance is low.

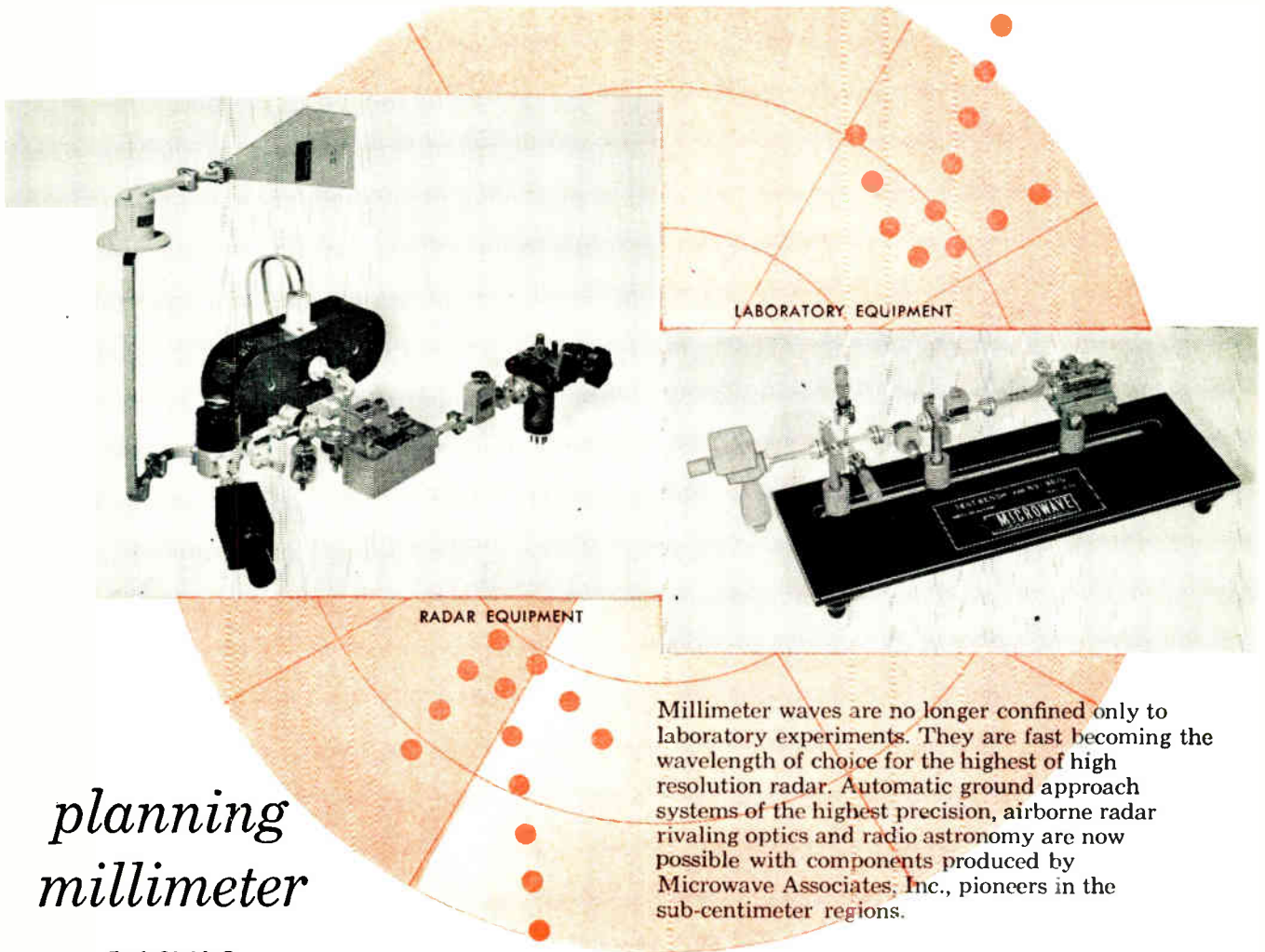
- Strips of plastic tape will insulate splices or form harnesses.

- The cable, with 9 to 50 conductors, can be cut with scissors or dispensed from a tape dispenser.

Stromberg-Carlson, one of the try-out customers, is using the cable in a new kind of multiple-chassis construction. See photo below. Printed-circuit boards form the leaves of a book.



Fourteen-conductor flat cable is soldered as a unit



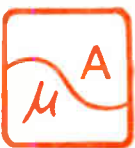
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Millimeter waves are no longer confined only to laboratory experiments. They are fast becoming the wavelength of choice for the highest of high resolution radar. Automatic ground approach systems of the highest precision, airborne radar rivaling optics and radio astronomy are now possible with components produced by Microwave Associates, Inc., pioneers in the sub-centimeter regions.

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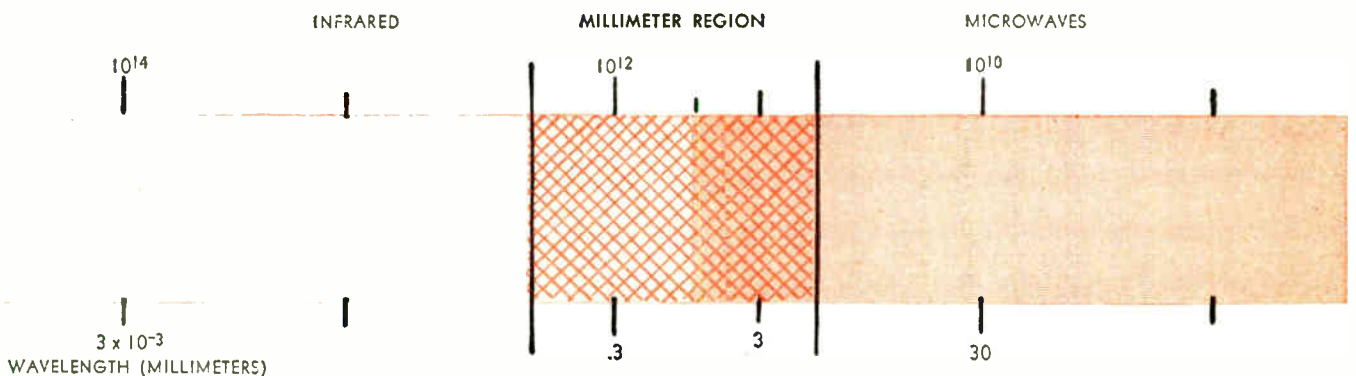
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# Unraveling GI Red Tape

**More electronics firms are bidding on military contracts. To buck red tape, they turn to specialists**

THE PRESIDENT of a small electronics firm last week said: "The number of small military contracts a firm our size can handle is going up."

"Even so," he added "I've passed up bidding on some good contracts for fear of getting involved in red tape. I can't afford doing that any longer, so I have hired a specialist to unravel the red tape."

His statement is typical of four of five small and medium sized electronic firms checked who are not now doing military work.

Complexity of military contracting has given rise to an army of contract specialists, mostly with large companies. They pore over military lists of procurement orders, analyze items in relation to their firm's capabilities.

They oversee bidding, and on successful bids, watch over contract details until payment.

Bisnoff-Armus Associates is a recent entrant in the field of contract consultants. They are similar to specialists within the firm.

Understanding government contract procedure, says Bisnoff-Armus, is an important part of making a profit or at least not getting trapped into taking a loss. Here are examples of how it works:

One electronics firm put in a low bid of \$20,000 for a piece of electronic medical equipment. Other bidders were in the \$26,000 and up range.

Although the company had developed a source of supply for material which permitted a low bid, an accountant's miscalculation made it too low. The contract officer, bound by legal procedure, questioned the bid. The firm reevaluated its bid, found the error, raised it to \$24,000, kept the award.

In another case, awareness of pre-award survey and its procedures gave one small electronics company a contract it would not otherwise have had. The firm knew it did not have sufficient facilities and employees to meet the demands of the survey for a large order of radio receivers. It also did not have sufficient funds to continue production until first deliveries when government money is released.

It analyzed how much of the contract it could handle, found a company that would subcontract the rest. It arranged for bank financing. It made agreements with the subcontractor and the bank that would become binding on a certain date.

The company then entered a bid that would be open for 30 days. That would have permitted it to withdraw the bid if it didn't win.

The firm did present the low bid; the survey was completed in the 30-day period, though the government in offering the contract had requested 60 days.

If the government had not completed its survey in the required time, the company would have sent a telegram asking for an extension. The word "no" in reply would have ended the bid. If the contract officer attempted to dismiss the bid because of information gotten from the survey, he would have been required to state grounds and answer rebuttal.

## MILITARY ELECTRONICS

- **USAF** drops further development of North American's air-breathing Navaho. Available funds and emphasis will go to Titan, Atlas and Thor. Air-breathing Snark, recently ordered into production, is intended to fill the strategic gap until ICBM is perfected.

- **Testing** and calibration of Navy's Sidewinder infrared detection system is being accomplished by an infrared radiation standard developed by Servo Corp. of America. Called Servo Model 1380, the device tests the sensitivity of the lead-sulfide cell which is the heart of the Sidewinder target detector.

- **New production** order for Corporal guided missiles by Army Ordnance marks sixth year of continuous production of Corporal by Firestone.

- **Army** plans to put largest number of its R&D dollars on antimissile missile program. Both AF and Army report that technological problems that seemed insoluble last year can be overcome.

- **Inertial guidance** systems for Thor will be built by A.C. Spark Plug division of General Motors under \$38 million contract with Air Materiel Command.

## CONTRACTS AWARDED

U. S. Army Signal Supply Agency, Philadelphia, has contracted GE for development models of preamplifier, frequency multiplier, intermediate amplifier and final output tubes. Contract: \$267,012.

**Beckman Instruments** for 600 frequency meters, FR-67/U, amounting to \$359,118.

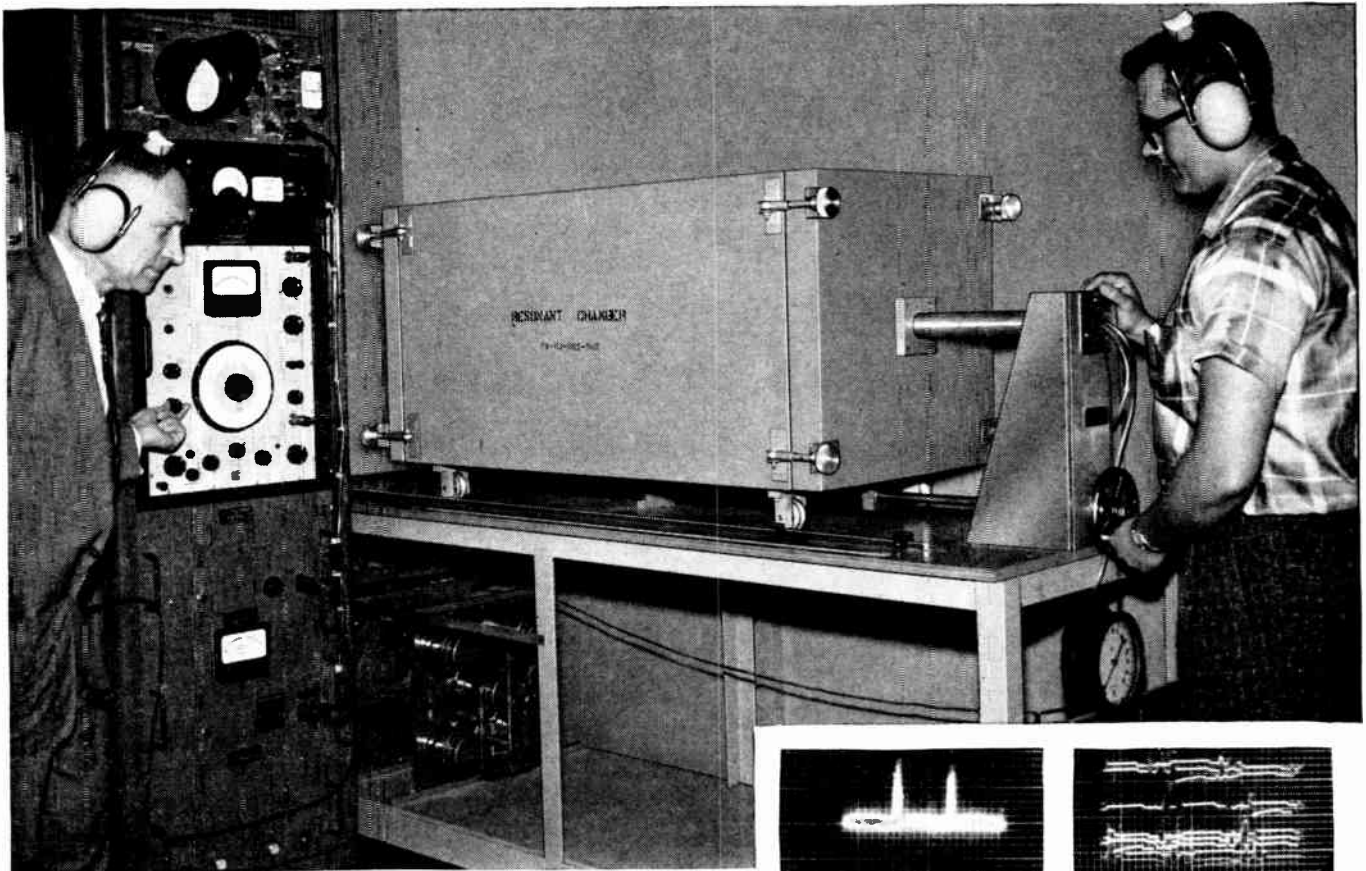
**Collins** gets \$500,000 contract with Army Signal Supply Agency for design plan of SSB tactical transistorized radio receiver and transmitter.

**Belock Instrument** will modify M-4 radars for Army Signal Supply



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L to R: Dr. Fricke, Engineer-in-charge Acoustics Laboratory, and Mr. Kuzara Acoustics Engineer, evaluating a component in a high intensity acoustic environment. RIGHT: Malfunction of a relay at high-intensity sound as disclosed in a sound chamber.

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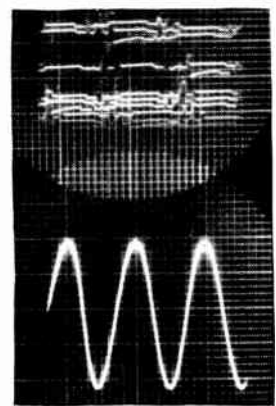
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Agency under S382,496 contract.

Litton Industries is awarded S214,-902 contract with Army Signal Supply Agency for inertial autonavigators, installed and maintained for one year.

Sparton gets \$1,576,164 BuAer contract for AN/SSQ-2B listening sonobuoys.

Texas Instruments will sell sonar sets to BuAer totalling \$1,038,200. Stoddart has \$209,381 contract with BuShips for AN/URM-17 radio sets.

Philco will conduct studies and investigations directed toward development of high-speed rotary transistor switch for BuShips under S238,350 contract.

Model Eng. and Mfg. will sell BuShips AN/USM-24C oscilloscopes under S313,547 contract.

Raytheon has \$1,580,056 contract with BuShips for forty-eight AN/SQS-T3 sonar shipboard trainers.

Marcon Mfg. gets \$522,189 contract with Army Signal Supply Agency for radio set controls, C-435.

Henry Products will sell Army Signal Supply Agency antenna equipment, RC-292, under S357,260 contract.

Production Research gets \$311,436 contract with Rome Air Force Depot for blip-scan recorders, QRC-44.

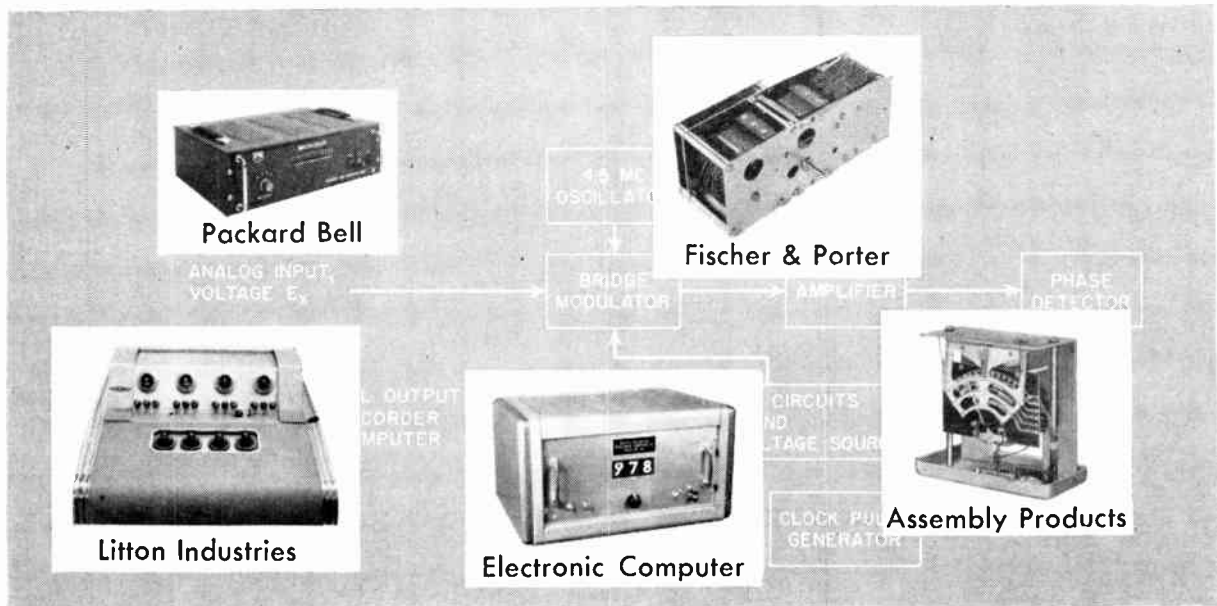
Collins will sell production data package for AN/ARC-52 radio sets and test-bench harnesses to BuAer under \$1,516,343 contract.

Westinghouse gets \$1,822,713 AMC contract for AN/APQ-61 radar sets and related equipment.

GPL will sell RADAN airborne doppler navigation systems to Martin for \$1 million.

Hazeltine wins \$3,147,475 contract with BuAer for AN/APS-20E radar sets.

# Data Converters Featured



## Units Simplify Computation

SOLVING problems with electronic computers is often simplified when data can be converted from digital to analog form or vice versa. Packard Bell (41) announces a completely transistorized analog-digital converter. Analog-to-digital converters for data-reduction systems and general voltage measurements are offered by Electronic Computer (42). Called the Digi-Coder, Fischer & Porter's (43) analog-to-digital converter now furnishes three more coded outputs.

An instrument developed by Assembly Products (44) functions as an analog-to-digital converter and multicontact meter relay for telemetering, testing, sorting applications. Digital-to-analog converters by Litton Industries (45) provide means for direct connection with analog computers, analog d-c plotters.

A 65-ma selenium rectifier is offered by Federal Telephone and Radio (46) for use in phonographs, small radios, tv boosters. . . . Coaxial electronically operated switches have been developed by Jerrold Electronics (47) to permit simultaneous display of two voltages on an oscilloscope. . . . The model 160 sweep-frequency vswr measuring system is offered by California Technical Industries (48) for the X band.

Accurate and rapid zeroing of synchros of all types is claimed for

Advance Industries (49) synchro null instrument. . . . Fine wire is ground to close tolerances by Royal Master (50) for use in electron tube elements, instrument movements. . . . Direct readings from zero cps to one mc are provided by Computer-Measurements (51) frequency-period counter.

Relays produced by Luther Mfg. (52) occupy 0.18 cubic inch and can handle 3 amps resistive load. . . . A total delay of 100 microseconds with taps every 2 micro-

seconds is provided with Control Electronics' (53) delay line.

Output voltages from 2 kv to 50 kv are furnished by scaled high-voltage power supplies offered by Laboratory for Electronics (54) for use with cathode-ray tubes, oscilloscopes, precipitators. . . . Print-through from one layer to the next on reels of stored tape is said to be greatly reduced with a new magnetic tape offered by Audio Devices (55).

Fixed film resistors designed by Corning (56) for operation from -55 to 235 C are made by bonding a metallic oxide film to Pyrex brand glass. . . . Self-contained resolver-booster amplifiers by Reeves Instrument (57) combine a size 15 resolver with two transistorized plug-in amplifiers in a cylindrical package. . . . International Rectifier (58) announces 330-amp germanium power-rectifier junctions which feature light weight and small size.

Accurate measurements of inductance, capacitance, resistance and conductance are said to be possible with Electro-Measurements' (59) impedance bridge assembly. . . . Alto Scientific (60) announces a pulse modulator and pluse transformer combination for

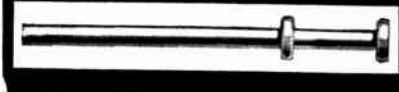
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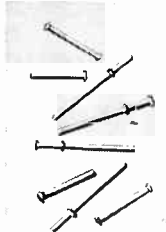


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testing high-power klystrons. . . . Transistor transformers designed by **United Transformer** (61) weigh only  $\frac{1}{8}$  ounce and are hermetically sealed in accordance with MIL-T-27A.

Characteristic curves of *pnp* and *npn* transistors are traced on a cathode-ray tube by **Tektronix's** (62) type 575 transistor-curve tracer. . . . A rotary switch announced by **Daven Co.** (63) is intended for video and pulse switching at up to 4.5 mc.

Transistorized electrometers designed by **Keithley Instruments** (64) combine a d-c amplifier and electrometer to measure eight ranges of voltage from 30 mv to 100 volts. . . . Mylar coil forms have been developed by **Precision Paper Tube Co.** (65) with wall thicknesses from 0.002 to 0.01 inch. . . . **Gorn Electric** (66) offers eight sizes of printed-circuit connectors featuring coined beryllium copper contacts.

Glass-mounted gold-plated quartz crystals by **Bliley** (67) operate on the third overtone mode at 5 mc. . . . Called the Utilator, a portable utility oscillator for the 4.5 to 220-mc range is announced by **Kay**

**Electric** (68). . . . Load isolators for the frequency range from 8,200 to 12,400 mc are announced by **Cascade Research** (69).

Four-foot dish antennas developed by **Technical Appliance Corp.** (70) for the frequency range of 1,000 to 4,000 mc feature simplified mounting to tubular masts. . . . **Burroughs** (71) announces the miniature Nixie, a 10-digit, cold-cathode read-out tube  $\frac{6}{10}$  inch in diameter and  $\frac{3}{4}$  inch long. . . . Phasemeters produced by **Statham Development** (72) are intended for laboratory and production testing of filters, transformers, amplifiers, computers.

Aircraft, marine and industrial applications are seen for **Superior Electric's** (73) 400-cycle voltage regulator. . . . Plug-in computer elements by **Ransom** (74) in the form of printed-circuit cards include flip flops, noninverting pulse amplifiers, power clock generators. . . . A bench comparator manufactured by **Stocker & Yale** (75) provides a method of setting relay contacts optically to precise gap dimensions.

Digital tachometers made by



## Anybody for Fission?

Visitors at Atomic Exposition try out low-power training reactor at instrument console costing about \$15,000. Aerojet-General Nucleonics reports it has 21 of these training reactors under construction

Nacimco (76) for missile and similar instrumentation applications can register better than 0.001 rpm. . . . Small transistorized power supplies for filament, transistor and plate voltage applications are available from Universal Transistor (77). . . . Transistorized plate power supplies offered by NJE Corp. (78) are said to have less than 1 millivolt ripple.

Subminiature r-f cable connectors have been introduced by Dage Electric (79) and include 12 groups of jacks, receptacles and adapters. . . . Herman H. Sticht Co. (80) is marketing English-made megohmmeters which indicate both resistance and conductance. . . . Direct reading r-f calorimeters by Electro Impulse Lab (81) cover frequencies from d-c to 4,000 mc and measure power from 10 to 150 watts.

Ferrite microwave isolators announced by Raytheon (82) for X and K<sub>E</sub> bands feature compact design and improved performance. . . . Dayton Electric Mfg. (83) announces five adjustable-voltage power supplies for laboratory and production-line testing. . . . Coils with standard a-c and d-c voltages are available in Hillburn Electronic Products' (84) control relays for use in printed circuits.

A vtm with a phase-sensitive circuit is offered by North Atlantic Industries (85) to measure both amplitude and phase angle in servo systems. . . . A tuning-fork electronic oscillator is used in Times Facsimile's (86) seagoing chronometer, which is said to have an accuracy of one second in 12 days.

Pressure transducers by Fischer & Porter (87) convert pressures from 3 to 15 psi to a-c voltages linearly proportional to pressure. . . . Librascope (88) announces a linear ball-and-disk integrator assembled with a counter and output pulse switch in one compact package. . . . Microwave absorber kits are being produced by McMillan Industrial (89) for all-weather radar operating in X or C bands on commercial and business aircraft.

Impedance-matching instruments

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**Enables fire control systems  
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**VERTICAL REPEATABILITY:** To within 10 minutes of arc cone.

**INITIAL-ERECTION (Super-Fast):** From any standing position at any temperature from  $-55^{\circ}\text{C}$  to  $+71^{\circ}\text{C}$  to within  $\pm 30$  minutes of arc of Vertical within 25 seconds after application of power.

**IN-FLIGHT ERECTION (Super-Fast):** Roll  $180^{\circ}$ /minute minimum. Pitch  $200^{\circ}$ /minute minimum.

**NORMAL ERECTION:**  $5^{\circ}$ /minute  $\pm 1^{\circ}$ /minute.

**FREE DRIFT:** Roll,  $0.3^{\circ}$ /minute for any Pitch angle from  $+60^{\circ}$  to  $-60^{\circ}$ . Pitch,  $0.3^{\circ}$ /minute for any roll angle.

**OPERATING LIFE:** 1000 hours minimum.

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by Uniwave (90) for the 1,000 to 12,000-mc range are said to match wide ranges of impedance, introduce impedance in otherwise matched systems, function as crystal detectors. . . . Subminiature floated integrating gyros are announced by Reeves Instrument (91) for missile and other airborne applications.

Multichannel magnetic tape-recording systems offered by American Electronics (92) feature 300-kc bandwidth and six speeds up to 60 inches per second. . . . Miniature tantalum electrolytic capacitors have been designed by Mallory (93) for service at 175 C.

### New Product Makers

- 41: Packard Bell, 11766 W. Pico Blvd., Los Angeles 64, Calif.
- 42: Electronic Computer, 6191 Ridge Ave., Philadelphia 28, Pa.
- 43: Fischer & Porter, 93 Jacksonville Rd., Hatboro, Pa.
- 44: Assembly Products, Chesterland, Ohio
- 45: Litton Industries, 336 N. Foothill Rd., Beverly Hills, Calif.
- 46: Federal Telephone and Radio, 100 Kingsland Rd., Clifton, N. J.
- 47: Jerrold Electronics, 23 and Chestnut St., Philadelphia 3, Pa.
- 48: California Technical Industries, 1145 Old County Rd., Belmont, Calif.
- 49: Advance Industries, Cambridge, Mass.
- 50: Royal Master, State Highway 23, Riverdale, N. J.
- 51: Computer-Measurements, 5528 Vineland Ave., North Hollywood, Calif.
- 52: Luther Mfg., 7512 Varma Ave., North Hollywood, Calif.
- 53: Control Electronics, 1925 New York Ave., Huntington Station, N. Y.
- 54: Laboratory for Electronics, 75 Pitts St., Boston 11, Mass.
- 55: Audio Devices, 441 Madison Ave., New York, N. Y.
- 56: Corning Glass Works, Corning, N. Y.
- 57: Reeves Instrument, 215 East 91 St., New York 28, N. Y.
- 58: International Rectifier, 1521 E. Grand Ave., El Segundo, Calif.
- 59: Electro-Measurements, 7524 S.W. Macadam Ave., Portland 1, Oregon
- 60: Alto Scientific, 855 Commercial St., Palo Alto, Calif.
- 61: United Transformer, 150 Varick St., New York 13, N. Y.
- 62: Tektronix, P.O. Box 831, Portland 7, Ore.
- 63: Daven Co., Livingston, N. J.
- 64: Keithley Instruments, 12115 Euclid Ave., Cleveland 6, Ohio
- 65: Precision Paper Tube Co., 2035 W. Charleston St., Chicago 11, Ill.
- 66: Gain Electric, 815 Main St., Stamford, Conn.
- 67: Billey Electric, Union Station Bldg., Erie, Pa.
- 68: Kay Electric, 14 Maple Ave., Pine Brook, N. J.
- 69: Cascade Research, 53 Victory Lane, Los Gatos, Calif.
- 70: Technical Appliance Corp., Sherburne, N. Y.
- 71: Burroughs Corp., Plainfield, N. J.
- 72: Stadium Development, 12111 W. Olympic Blvd., Los Angeles 41, Calif.
- 73: Superior Electric, 83 Laurel St., Bristol, Conn.
- 74: Ransom Research, P.O. Box 382, San Pedro, Calif.
- 75: Stucker & Yale, Marblehead, Mass.
- 76: Nacenco Products, 2300 National Ave., National City, Calif.
- 77: Universal Transistor, 143 E. 49 St., New York 17, N. Y.
- 78: NJE Corp., 345 Carnegie Ave., Kenilworth, N. J.
- 79: Page Electric, 67 N. Second St., Beach Grove, Ind.
- 80: Herman H. Stiehl Co., 27 Park Place, New York, N. Y.
- 81: Electro Impulse Lab, 208 River St., Red Bank, N. J.
- 82: Raytheon, Seven Bldg., Waltham 51, Mass.
- 83: Dayton Electric Mfg., 114 S. Oakley Blvd., Chicago 12, Ill.
- 84: Hillburn Electronic Products, 55 Nassau Ave., Brooklyn 22, N. Y.
- 85: North Atlantic Industries, 603 Main St., Westbury, N. Y.
- 86: Times Facsimile, 510 W. 58th St., New York, N. Y.
- 87: Fischer & Porter, 93 Jacksonville Rd., Hatboro, Pa.
- 88: Librascope, 808 Western Ave., Glendale, Calif.
- 89: McMillan Industrial Corp., Brownsville Ave., 90: Uniwave, 2 Marine St., Farmingdale, N. Y.
- 91: Reeves Instrument, 215 E. 91 St., New York 28, N. Y.
- 92: American Electronics, 655 W. Washington Blvd., Los Angeles, Calif.
- 93: P. R. Mallory, Indianapolis, Ind.

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# New Orleans Gets TASO Look

**Organization will stay in the neighborhood until unique simultaneous uhf-vhf operation begins**

TELEVISION Allocations Study Organization (TASO) is digging into the aftermath of more than 10 years of FCC television channel allocations. This month TASO started gathering facts, after six months of organizing for the massive task.

The industry-wide TASO group is finding out what the FCC needs to know before making further decisions about extending tv service. One of TASO's first studies is under way in New Orleans.

Engineers in a station wagon are making signal field-strength measurements on stations WDSU-TV (channel 6), WWL-TV (channel 4) and WJMR-TV (channel 20). Simultaneously, other engineers are inside homes looking at tv sets.

Homeowners are asked to turn on their sets. The setowners' opinions of the picture ("It's just plain lousy. I repeat, lousy," said one. "I love it," said another) are equated to coded technical evaluations. Opinions of the householders thus far vary only slightly from the technical appraisal. The quality of

the set, the apparent condition of the antenna and distance from the station are noted.

Field strength tests will be made in nearby Baton Rouge, another uhf-vhf town, so that units can return to New Orleans to observe and participate in a unique experiment by WJMR-TV.

With FCC permission, the station will operate simultaneously on both channels 20 and 12. It will set up monitoring points throughout New Orleans to compare the two signals.

Another TASO group is in Boulder, Colorado, analyzing years of accumulated data on tropospheric propagation. Groups have also invaded Wilkes-Barre, Pa., and Fresno, Calif. The Fresno group is now digesting preliminary findings. It will reinvade that community for an extensive test.

Studies of boosters and satellites are now going on.

The investigation of tv receivers, requiring manufacturers' cooperation, was bogged down until the Justice Department ruled that cooperation did not violate the antitrust laws.

Summation of TASO progress by its executive director George Town: "We're all thoroughly organized. Most of our panels are well under way; others are about to blossom forth."

## STATION MOVES AND PLANS

Mutual Broadcasting System, with its more than 400 affiliate radio station contracts, now belongs to a group headed up by Los Angeles broadcasting executive Paul Roberts. The Roberts combine paid around \$500,000 to RKO Teleradio Pictures for the network.

Roberts takes over as Mutual's president.

WJIV, Savannah, Ga., plans increasing power fivefold to 5 kw, installation of new transmitter.

KWWL-TV, Waterloo, Iowa, plans changing studio location from more than one mile outside of Waterloo into town.

KIIQ-TV, Spokane, Wash., plans auxiliary antenna system.

KLUB, Salt Lake City, Utah, plans installation of new auxiliary transmitter.

WRRR-FM, Ithaca, N. Y., along with sister stations, WWRC-FM,

## FCC ACTIONS

- **Amends** allocation table for class B f-m broadcast stations. Revision adds channel 235 to Philipsburg, Pa.

- **Proposes** to allow an increase in daytime power of local a-m broadcast stations. This would boost maximum power from its present limit of 250 watts to 1 kilowatt. If increase results in interference, directional antennas may be used.

- **Considers** permitting on-channel uhf boosters so that uhf stations can reach shadow areas. Power of boosters would be limited to that required to provide a 5 microvolt per meter signal at farthest boundary of principal area being served by the station. No more than the present maximum of 5 kw output would be approved.

- **Adds** television channel 10 to Presque Isle, Me.

- **Mulls** over more changes in class B f-m allocations plan. Commission may add channel 264 to Santa Catalina Island, Calif. This move would involve other California switches. Channel 235 would go to Ventura to compensate loss of 264, 260 would go to Santa Barbara for 236, 223 for 260 at San Luis Obispo and 279 for 264 at Palm Springs.

- **Invites** comments on proposal to reallocate the frequency 161.6 mc to the Maritime Mobile Service. This would delete frequencies 161.580, 161.595, 161.610 and 161.625 mc, which had been proposed for Railroad Radio Service. The Commission would give the railroads the following frequencies: 160.215, 160.230, 160.245 and 160.260 mc.

- **Proposes** to free another educational tv channel for commercial use—channel 9 in Eugene, Ore.



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**COMPONENT MARKING**  
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Typical marking problems solved by Markem include automatic color banding with up to six colors on wire lead components; printed circuit work on the new 90S screen process machine; base branding TV tubes in cartons and in sets; imprinting flat disc capacitors, ten foot lengths of rigid conduit, metal and glass tubes, odd-shaped automotive electrical parts.

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 Thermal Time Delay Relay

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Component  
 Sales  
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"SNAPPER"  
 GLASS RELAYS  
 —for commercial applications, single-pole double throw snap action.

MAGNETIC  
 AMPLIFIERS  
 —custom-designed to fit complex requirements for control systems.

"MEMORY"  
 RELAYS  
 —thermally operated bi-stable time delay relays with two separate heater circuits.

WRRD-FM, WRRE-FM and WRRL-FM, plan to continue multiplexing, changing to multiplex type FME-50 exciter unit.

WICU, Erie, Pa., increases power to 316,000 watts and constructs new tower. Tv station expects to reach 2 million more people.

WCPC, Houston, Miss., increases power from 1 to 5 kw.

WQOK, Greenville, S. C., is sold by Speidel-Fisher Broadcasting to Dick Broadcasting for \$125,005.

WMVG, Milledgeville, Ga., changes hands. Jere N. Moore sells to Michael T. Landy. Price is \$35,000.

KJAY, Topeka, Kans., control passes from Robert and Jeanne Rohrs to Dale S. Helmers group for \$142,500.

WGIF-FM, Brookfield, Conn., goes on the air. It will multiplex.

WNAR, Norristown, Pa., installs new transmitter.

WMUB-TV, Oxford, Ohio, installs new transmitters and antenna system.

KNOC, Natchitoches, La., installs new antenna.

CBS Television Network plans to increase Hollywood, Calif., tv facilities. Two studios, seven rehearsal halls and an administrative building will be added to the original plant built in 1951. Network expects completion in late 1958.

KUMV-TV, Williston, N. D., goes on the air. Station is owned by 7,000-member nonprofit corporation that was formed solely to bring tv to the eight-county area.

WFIL-TV and WRCV-TV, Philadelphia, Pa., plan to share same antenna tower. They expect to complete the 1,000-ft tower by the end of September.

NBC network president Robert Sarnoff predicts feasibility of inter-continental live-tv link between U. S. and Europe within five years.





Customers learn the ropes as . . .

## Training Boosts Goodwill

Complex gear aggravates maintenance problem but one answer to it is a customer training program. This answer also sweetens relations

A THORN in the flesh can be turned into a shot in the arm. That's what Lenkurt Electric feels its customer-training program is doing.

Three years ago Lenkurt faced a problem common to many electronics manufacturers. Stepping up performance of its main product, carrier telephone equipment, made problems more complicated for its customers.

Existing maintenance procedures couldn't cope with the complex, miniaturized equipment. Shortage of qualified operating and maintenance personnel was becoming critical.

Lenkurt undertook the training of customer personnel, gratis. By so doing, it has welded closer ties with its customers, boosted sales and fostered goodwill.

Before starting the school, Lenkurt asked its customers about their needs. It also checked in-plant training programs of several telephone companies.

Course starts with familiarization and proceeds to detailed explanations of equipment theory. Then it is topped by having the students ferret out simulated troubles in the equipment.

Currently, a three months backlog of students exists. The firm employs two full-time instructors. Tuition and materials are free. Tab

for transportation and living expenses is picked up by customer companies.

Customers are well aware of one big advantage enjoyed by Lenkurt-run classes. They avoid the expense of elaborate demonstration equipment. "The twelve racks of equipment in our classroom have proved to be our biggest asset," states Lenkurt.

Company is collaborating with a home-study organization for a do-it-yourself manual. Information about telephone carrier principles will be made available to telephone technicians and technical personnel in allied industries.

Lenkurt has also instituted engineering-training conferences. Their goal: tailoring a familiarization program to the requirements of engineers employed by customer companies.

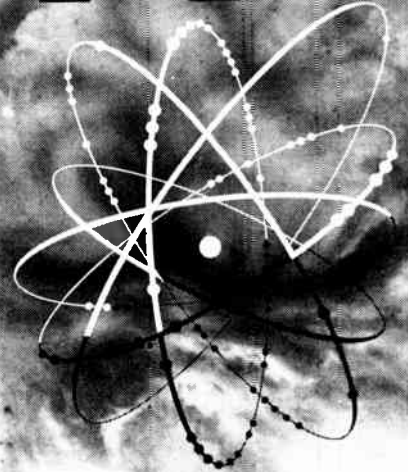
Lenkurt reports welcome by-products of its training courses and engineering conferences. In addition to improving acceptability of a complex product, the training course-conference plan sets up a two-way communication system with engineering and plant departments of major operating companies. Lenkurt design engineers have reportedly received some useful technical suggestions from their customer trainees.

ACCEPTED SYMBOLS

79

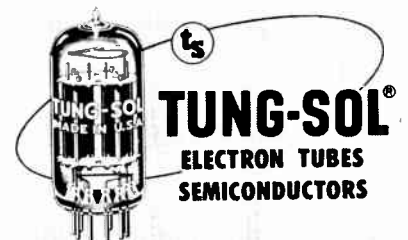
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Au

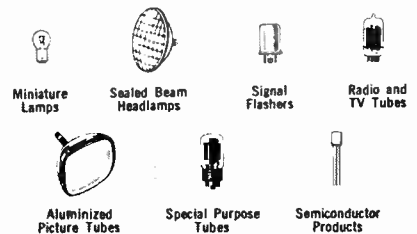


Symbol for gold . . . the element whose inert properties make it ideal for plating grids of electron tubes to protect them against contamination.

Just as Au is the accepted symbol for gold, so Tung-Sol represents the highest quality production of electron tubes to volume requirements. This singular ability is a major reason why Tung-Sol is America's largest independent electron tube manufacturer.



Tung-Sol Electric Inc., Newark 4, N. J.  
Manufacturers of Automotive and Electronic Components.



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# Navigating by Inertia

**Inertial guidance systems for ships, planes and missiles may spawn a \$400-million business for electronics. Systems are immune to hostile jamming**

ELECTRONICS' share of inertial navigation-control business will jump ten-fold—from \$40 million to \$400 million—in 15 years. This is a conservative prediction made recently by experts in the field.

New inertial guidance systems are expected to spearhead growth.

Inertial guidance is a jam-proof form of navigation for airplanes, missiles and ships. Natural phenomena (sunspots, weather, magnetic influences) do not interfere with it.

An IG system is from 25 percent to 40 percent electronic. Remainder is electromechanical.

IG system of four years ago had over 300 tubes. Today, such a system uses about six tubes and 200 transistors.

Two key figures at MIT's Instrumentation Laboratory are prominent in development of inertial guidance. They are: Charles S.

Draper, lab director and head of MIT's Dept. of Aeronautical Engineering, and Walter Wrigley, lab's educational director and a professor of aeronautical engineering.

"Electronics is a messenger in the IG system," says Draper. He points out that standard servo circuits are used in the system.

"What we have done is apply electronic techniques to a new and different field requiring precision control," he explains. In IG, electronics computes, processes and controls data.

What does an IG system cost? One estimate is \$50,000. Another is, "tens of thousands." It's believed costs will have to drop sharply—down to \$5,000-\$8,000—before inertial-guidance systems are commercially feasible.

Draper and Wrigley think IG's new accuracy and dependability assure its widespread use in 15 years.

total energy of a strong lightning discharge in our atmosphere.

The short pulses, discovered just a year ago, last on the average three hundredths of a second and seem to be less frequent than the long.

Gallet suggests the radio signals—long and short—may have shock-wave origins. "Perhaps they come from geyser-like phenomena or some sort of volcanic activity, although completely different from any such activity we know on earth, because the material constituting Jupiter is different from that of Earth."

Gallet thinks that the most important evidence he has gathered about Jupiter proves the huge planet has a strongly ionized upper atmosphere.

## School Comes to Factory

New wrinkle in training employees is being tried in Connecticut.

Royal McBee Corp. in Hartford brings the school into the plant. Instructors from the nearby Ward School of Electronics are teaching an electronics course to about 50 of the firm's employees. The company may raise enrollment to 300 in the fall.

Some reasons Royal McBee likes the hire-a-school plan: It is flexible and tailor-made. It provides new, outside ideas. It assures technically-qualified, experienced instructors. New trends can be more easily inserted into the teaching program.

Employees taking the course like the formal atmosphere created by use of outside instruction, reports the company. A worker also feels the company is helping his development.

Both the company and employee contribute. Afternoon classes (three times weekly) last two hours. The firm pays the employee his regular wage for one hour. The employee gives the second hour from his free time.

Royal McBee feels the course fulfills a need for engineering, technical and managerial understanding of the electronics field. Hence, a cross-section of technical and administrative personnel from many departments are taking the course.

## Report From a Large Planet

Radio signals of tremendous power from Jupiter, a planet 318 times larger than the Earth, are under close study at the Boulder (Colo.) Laboratories of the National Bureau of Standards.

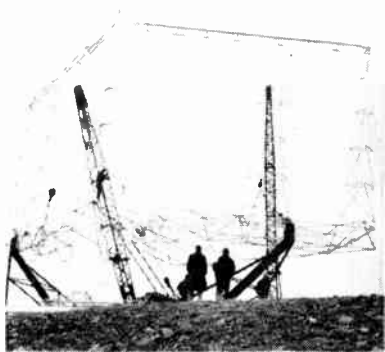
Roger Gallet, astrophysicist who has been working on the project

the past two years, said data recorded on equipment designed by Kenneth L. Bowles of the NBS staff, points to five sources of the signals. However, there are indications, Gallet says, "that there are many more of weaker strength with emissions blended together."

Some observers speculate that the signals may have been caused by mighty thunderstorms on Jupiter.

Gallet said his work discounts the thunderstorm possibility since lightning discharges, unlike the Jupiter "emitters," do broadcast on all frequencies at the same time.

Gallet has concentrated on two kinds of pulses—long and short—sent out by the planet. The long pulses can be measured more precisely. They average two seconds in duration and generate 100 thousand times more energy than the



Reaching out for signals from Jupiter

For your immediate use  
the 6 most vital assets  
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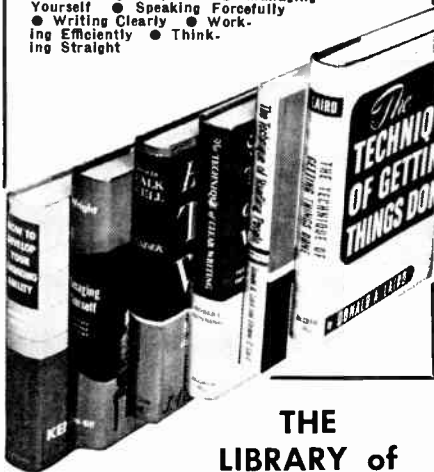
## EXECUTIVE SUCCESS



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# Brazil Topping \$60 Million

**Increased power capacity points to further growth; Foreign manufacturers are encouraged**

BRAZIL'S \$60-million electronics industry this year is pushing to a new high level, but stiff injections of credit are needed to keep it going. Some radio and tv manufacturers give dealers 12-14 months to pay because of a government-imposed credit squeeze.

Here's how demand for electronics shapes up:

- Brazil's 60-million population is growing at the rate of 2.5 percent a year. Only 27 percent is in electrified areas. However, President Kubitschek has ordered power capacity upped from 3 to 5-million kw by 1960.
- Television is growing fast; there are now 300,000 sets, six stations. At least five more stations are planned. Estimated potential audience that can be reached by these 11 stations: 10-million people. This year's set production will exceed last year's 60,000.

- An estimated 430,000 radios will be turned out in 1957; 1 million were made in the last two and a half years. Production of record players may reach 70,000; special tubes and turntable components are imported.

Right now, Brazil offers incentives to foreign firms that want to manufacture in the country. Production equipment enters at the free rate of exchange, and when a commodity is produced in Brazil, it is put in a trade category that prevents competitive imports. However, a new customs tariff law under consideration may change this.

Some foreign firms manufacturing in Brazil look to other South American countries for new markets. The Dutch Philips' Brazilian subsidiary, which reportedly has 20 percent of the market, also exports equipment to Portugal, India and the Far East.

But current exchange problems must be ironed out, if exports are to continue, say manufacturers. They claim present rates are pinching, hope for a change before next year.

About \$2 million in U. S. aid is going into radar and ground approach gear for three airports.

## DEVELOPMENTS ABROAD

- **In West Germany** a television probe for direct studies of geological soil structures in small borings up to 1,000 ft has been developed by Grundig Radio-Werke GmbH, Fuerth, Bavaria, and a group of outside engineers. Probe is said to be used in borings of 2.5-in. diameter, even if filled with water, and regardless of the direction or straightness of the boring. Picture taken by miniature camera is transmitted by control set above ground. The 2.4-in. probe is connected with a 30-conductor cable which reportedly can be sunk without interruption or sliding contacts.

- **British** Institute of Physics has published 13-article review of advances and potentialities in fields of nondestructive testing, covering ultrasonic testing, industrial radiography and specialized optical techniques.

- **In West Germany** new loud-speaker membrane developed by

Physikalisch-Chemisches Entwicklungs-Laboratorium Dr. Emil Podszus & Sohn, Nuremberg, is claimed to eliminate or substantially reduce distortion at high audio frequencies.

- **In Manchester, England** Metropolitan-Vickers announces development of a flexible packaged kinetic simulation system for aircraft industry use. System provides laboratory simulation of high-speed flight conditions and study of deformations caused by thermal stresses.

- **In England** Edison Swan Electric Co. and the British Atomic Energy Research Establishment have designed jeep-mounted equipment for searching out uranium and other radioactive ores. Scintillation probe detects change of plus or minus 0.0005 percent in 0.003 percent radioactive ore in bedrock. Ratemeter rings bell, flashes light if radioactive ore is detected.

## EXPORTS and IMPORTS

**In Cologne, West Germany,** Leybold-Hochvakuum Anlagen, GmbH, and High Voltage Engineering Corp., Burlington, Mass., open a new electron radiation facility on a commercial basis for experimental and limited production. U. S. firm supplies 2-million-volt, 0.5-kw Van de Graaff electron accelerator for the center, which is managed by Leybold.

**British** trade groups are so encouraged by their first Instruments, Electronics and Automation exhibition this year that they plan one for next year international in scope. The 1958 exhibition will be held in Olympia, London, April 16-25. Total attendance at this year's exhibition was 53,084, including 2,690 overseas buyers.

**In West Germany** the Association of the German Electrotechnical Industry says Germany produced 3.8-million radios and 600,000 tv

sets in 1956, exported 1.6-million radios and 60,000 tv sets. Says the Association: the Germany home market will need 2-million radios annually during the next few years; tv set production will amount to 800,000 in 1957.

Australian electronic instrument importers are pressing for a change in the existing import licensing system which requires a definite order before an import license is issued. Prospective buyers have been reluctant to place orders without seeing instrument demonstrations. Trade circles believe there is a strong demand for small electronic instruments in Australia and think the government will liberalize its import policy.

Japan's Toyo Communication Equipment Co. will get technical information and assistance from Packard-Bell Electronics Corp. in the manufacture of airborne identification equipment under the U. S. government technological assistance program.

West Germany Air Ministry places a \$600,000 order for automatic direction finders with Lear Electronic GmbH, Munich subsidiary of Lear, Inc., of Santa Monica, Calif.

French portable microwave equipment weighing less than 46 pounds per unit and waterproofed for floating on water is being manufactured and marketed in the U. S. by Intercontinental Electronics Corp., Mineola. Intec says the equipment can be put into operation at an emergency location in five minutes, provides 12 telephone circuits.

In London agreement has been reached on a 788-mi undersea coaxial cable to be laid from Scotland to Iceland via the Danish Faroe Islands. It is scheduled to go into service in 1959 and will provide some telephone and telegraph circuits for civil air traffic control on transatlantic routes.

London's Solus-Schall Ltd. receives a contract from Taylow Woodrow Ltd. to carry out gamma radiography on a 60-mi-long Nigerian oil pipeline being constructed for Shell Petroleum (Nigeria) Ltd.



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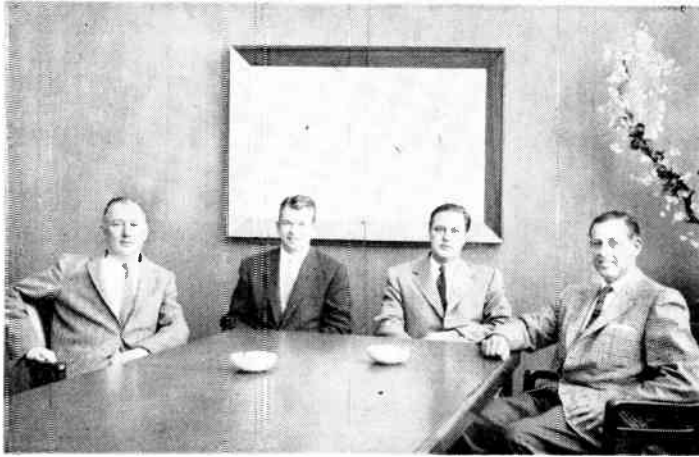
**AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN,"** another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it" — "they" being all the industry's front line of innovators and improvers — and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you — giving a ready panorama of up-to-date tools, materials, equipment.

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**McGRAW-HILL PUBLICATIONS**

## PLANTS and PEOPLE



### New V-p's for HP

EXPANSION of existing facilities, according to officials of West Coast Electronic Manufacturers Association, is setting the pattern of growth this year for the electronics industry in the West. This is especially true of the San Francisco Bay and Peninsula area. More than 1.5 million sq ft of plant capacity will be added by Bay area manufacturers this year.

Hewlett-Packard reflects the general trend. The Palo Alto instrumentmaker is spreading out into two new 80,000-sq ft manufacturing units in Stanford Industrial Park. The units bring HP's total plant space to 300,000 sq ft.

Besides physical growth, the company, which has got along for years without any vice presidents at all, now has appointed four men to officer ranks. "Expanding responsibilities in management" was given as the reason.

The four officers (picture) moved into jobs directly related to the

ones they previously held. Treasurer Frank Cavier was made vice president for finance. W. Noel Eldred, the general sales manager, moved up to marketing vice president. Noel E. Porter was general production manager, now is v-p in charge of manufacturing. Research director Bernard M. Oliver was made v-p in charge of research and development.

Hewlett-Packard's money managers were also shifted a bit. Chief auditor Edwin van Bronkhorst became secretary-treasurer, and accountant David Bates moved into the job of assistant secretary.

### RCA Splits Tube Division

RCA divides its electron tube division into two autonomous units, aiming to tackle separately the problems of industrial and entertainment tube types. Three management jobs were created and filled in the split.

Former general marketing manager L. F. Holleran moves into the job of manager for distributor products. He will direct renewal sales on all tube lines and handle distributor sales for other RCA components and semiconductors.

John B. Farese moves up from the job of personnel manager to take over as manager of entertainment tube products. Manager C. F. Burnett of cathode-ray and

power-tube operations becomes manager of industrial tube products.

Both new operating managers will have responsibility over development, design and manufacture. They will also direct sales to equipment manufacturers and the government.

In another part of the corporation, Pinckney B. Reed, v-p for the government service department of RCA Service Co., becomes RCA's vice president for international sales. His boss, executive v-p for sales and services Charles M. Odorizzi, takes a seat on the corporation's board. Odorizzi replaces Coca-Cola president William E. Robinson, who resigned.

### Litton Builds Magnetron Plant

LITTON Industries is putting up a new plant in Salt Lake City. The plant, which will employ about 600 people, will cover 60,000 sq ft. It will be used for the manufacture of magnetrons, klystrons and other microwave tubes.

The Salt Lake City facility will serve Litton's electron tube division, which is headquartered in San Carlos, Calif.

To head the new plant, Litton hired Vinton D. Carver away from Farnsworth Electronics. Carver was vice president of the IT&T subsidiary, general manager of its Pacific division.

Glen McDaniel, the first full-time president RETMA (now EIA) ever had, and now president-emeritus of the manufacturers' association, meanwhile moves onto Litton's board of directors.

### Motorola Moves Market Execs

IN ONE of several moves strengthening its marketing and sales structure, Motorola creates the post of manager, military electronics marketing. Moving into the slot is Robert Barton, formerly with the firm's Western area military electronics center.

New western region sales manager for Motorola's semiconductor

### BUSINESS MEETINGS

Aug. 16-18: Radio-Tv-Electronic Service Industry Convention, Sheraton Hotel, Chicago.

Aug. 20-23: Western Electronic Show and Convention (Wescon), at the Cow Palace and Fairmont Hotel, San Francisco.

products is William Montgomery. This appointment gives the Chicago manufacturer direct factory coverage across the nation.

William S. Wheeler moves into the managership of the firm's Chicago military electronics center, succeeding Arthur Jones who resigned. Wheeler was formerly assistant for corporate planning to the company's president.

Motorola's communications and industrial electronics sales division moves its sales, service and warehousing activities into a leased two-story building on Chicago's north side. The 60,000-sq ft building will let the division clear out of warehouse space in North Pier Terminal, will also make room in the Cicero Avenue plant for expanding microwave manufacture and engineering.

## ECI Hires Management Man

SAN FRANCISCO manufacturer Electrical Communications Inc. hires management expert Isaack Herman as general manager. The 30-year-old firm, planning production expansions involving a move to larger quarters, is currently developing transistorized remote-control and signaling apparatus.

Herman was a principal in the management consulting firm of Chase, Ward & Gardner, San Francisco. He will take charge of all operations of the recently re-financed firm.

## Beckman Firms Sales Lineup

BECKMAN Instruments makes a series of moves strengthening its marketing and sales setup.

New western district manager for process instruments is George A. Green, moving up from a product managership. Field engineer Ray St. Onge moves into the job of product manager for all instruments in the process instruments division. The division also gets a new advertising and sales promotion manager as former Bakelite ad manager Robert E. Klees moves in.

Beckman's Helipot division



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## McGRAW-HILL PUBLICATIONS



moves Arnold H. Henriksen into newly created job of manager for its Mountainside, N. J., plant. Henriksen had been production manager at the New Jersey facility. Newport Beach, Calif., factory manager John Pamperin moves up to become manufacturing director of the division.

The firm's scientific instruments division gets a new marketing director, hiring Robert J. Baumann away from General Mills. Baumann had been manager of industrial marketing for General Mills' O-Cel-O division.

Michael S. Dayton is now marketing manager of the Berkeley division, moving up from assistant marketing manager.

## Instrumentmaker Expands

MARION Electrical Instrument Co. is putting a \$250,000 wing on its Manchester, N. H., plant. The plant was opened less than two years ago, is already outgrown.

The 20,000-sq ft addition will make room for 100 new production people, raising total employment at the manufacturing and research center to 450. The wing increases plant space 50 percent.

## New Plant for Syl-Cor Nuclear

SYLVANIA-Corning Nuclear Corp. is putting up a 25,000-sq ft building next to its Hicksville, N. Y., plant. The added capacity will be used for manufacturing nuclear fuel elements.

The one-story plant will be finished early next year, is designed to permit future expansion. About 125 people will be employed there, according to John C. Robinson, who will be manager of the new facility.

## Pace Dedicates New S-C Plant

STROMBERG-Carlson is settling into a big electronics center and two new wings on its main plant. New

plant more than doubles previous production capacity at the firm's Rochester, N. Y., headquarters.

Frank Pace, Jr., president of parent General Dynamics, formally dedicated the buildings. Pace (at left in the picture, with S-C president Robert Tait and the automatic inserter) called the field of electronics "exciting," added "never has the future been brighter."



Pace with S-C's Tait

The 800,000-sq ft electronics center, bought from Bond Stores Inc., now houses most of the production and R&D activities of Stromberg-Carlson's electronics division. Special products division (electronic carillons, hi-fi systems and other specialized products will also move to the center. Space cleared in the firm's main plant will be used for telecommunication production.

Additions to the main plant provide 164,500 sq ft of space in an administration building and some 110,000 sq ft of added production space for telecommunications gear.

## Kaiser Builds Phoenix Plant

KAISER Aircraft & Electronics Corp. will put up the third of its electronics plants in Phoenix, Ariz. To be primarily a research and engineering facility, the plant will start as a one-story structure with room for expansion.

The building will be next door to General Electric's big computer development facility in Phoenix.

It will be managed by Lowell M. Shuck, who moves down from Kaiser's Toledo, O., plant to take over Toledo and Palo Alto, Calif., facilities are engaged in manufacture of missile gear and development of a thin cathode-ray tube.

## Varian Associates Shifts Execs

VARIAN Associates moves Arnold Wiltol up to be manager of manufacturing for the tube division. He replaces Howard Patterson, who is now v-p in charge of all Varian's microwave tube activities. Wiltol had been the division's production superintendent.

In other moves, instruments v-p Ralph W. Kane pulls Harold Secrest into a job as his staff assistant. Dan Lansdon, who is in charge of instrument application engineering, takes on Secrest's old job of sales order manager in addition to his other duties.

## New Panellit Executives

IN SKOKIE, Ill., Panellit executive vice president Walter P. Hooper takes a seat on the firm's board of directors.

The maker of control systems enticed William B. Denniston to give up his own farm supply business, making him sales manager. Former sales v-p Millard D. Shriver moves into the special vice-presidential office of assistant to the president.

## Plant Briefs

NEW HAVEN, Conn., manufacturer International Instruments is planning new plant development to consist of several buildings on a five-acre site in Orange, Conn.

Detroit wiremaker Hoskins Mfg. Co. is now moving into a 26,000-sq ft addition to its Lawton Ave. plant.

IBM's five-month-old Essex Junction, Vt., plant is already outgrown.



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A 32,000-sq ft addition is now going up, almost doubling plant space and permitting an increase to 500 employees.

New York instrumentmaker Eico Corp. is expanding into new, larger quarters in Long Island City, N. Y.

### Executive Moves

FORMER American Bosch Arma product manager Kenneth B. Boothe becomes director of sales for Kahn Research Laboratories, Freeport, N. Y.

Paul E. Bryant, general sales manager of Hoffman Electronics' radio division, moves up to take the job of sales v-p.

Zenith Radio moves John A. Miguel, Jr. up to v-p in charge of export. Miguel was manager of Zenith's international division.

Ralph C. Smith leaves Los Alamos Scientific Laboratory, where he was assistant director, to take the job of assistant to the president of ACI' Industries' Nuclear Products-Ireco division.

Richard Ochs, former v-p of American Measuring Instruments, moves to the instruments division of Philips Electronics as production manager.

Wendell E. Phillips moves from Electronic Communications Inc. to take over as engineering director for Mack Electronics, Plainfield, N. J., division of Mack Trucks.

Webeor moves Joseph L. Raffel up to executive v-p, gives Adolph Wolf the vice presidency for manufacturing and engineering.

Retiring rear admiral H. W. Seely joins Texas Instruments as field service engineering representative for Washington, D. C., and special interference-runner with the Defense Department.

L. F. Hickernell becomes engineering vice president of Anaconda Wire & Cable, pulling Leonard L. Carter into his old job as chief engineer.

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# Reps Add Nuts & Bolts

BUSINESS in nuts and bolts—plus wire, contacts, switches and similar hardware—is a stable income-producer to reps serving our industry.

Five new reps have taken on the electrical tape line of Bishop Manufacturing Corp., Cedar Grove, N. J. Waltham, deWitt & Krusi, San Francisco, is rep for northern California and Nevada; Industrial Engineering & Equipment Corp., Los Angeles, covers southern California and Arizona; and Denver rep J. C. O'Donnell handles the line in the Mountain states. In the Midwest, Sheldon Stover & Associates, Cincinnati, O., serves southern Ohio and Kentucky, and Cleveland's Public Service Supply Co. covers northern Ohio.

Precision wiremaker Secon

Metals Corp., White Plains, N. Y., appoints three new reps. Jay C. Angel, Chicago, will handle the line in the north central region; Bahr Sales, Southboro, Mass., covers most of New England and part of New York; Heim & Scheer, Los Angeles, will serve southern California, Texas and Arizona.

Electronic Plastics, Matawan, N. J., also has three new reps for its wire and components. Art Cerf, Newark, N. J., gets the nod for the mid-Atlantic states; Atlanta's Frank C. Nickerson handles the line in the South, and Mosher & Peyser, Needham, Mass., covers New England.

New southeast-states rep for contacts and contact assemblies of Pittsburgh's Gibson Electric is Charlotte, N. C. rep W. K. Hile.

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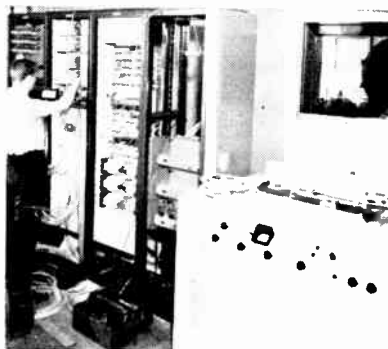
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## In Our August 1 ENGINEERING Edition, Don't Miss . . .

• **Corn-Fed Phones.** Selective calling of up to ten telephone subscribers per wire pair in rural areas is possible with transistorized transmitter and receiver described by B. R. Stachiewicz of Stromberg-Carlson. System uses double-sideband transmission and operates over line losses of 35 db. Subscriber receiver response is flat within 0.5 db as a result of circuit stabilization.

• **Color Tv.** F. T. Thompson of Westinghouse Research Labs explains how accurately phased horizontal and vertical synchronization pulses for color tv are obtained by sampling pulses from frequency divider chains. System provides an output corresponding in phase to a half-cycle of a high-frequency signal. Though the design is for 14.7-ke line and 60-cps field frequencies with 2.47-mc reference frequency, technique is directly applicable to NTSC color systems.

• **Canned Video.** R. H. Snyder of Ampex describes how tape speed and extended high-frequency response are achieved in magnetic



Tv magnetic tape recorder

tape recorder by revolving four recording heads transversely across the tape while tape moves only fast enough to keep successive tracks from overlapping. Recorded tapes have signal-to-noise ratios of 34 to 36 db with better than 300-line resolution and high contrast ratio.

• **Triple Threat.** Thirty-nine existing crystal oscillator circuits shrink into three basic designs using MIL-approved crystals and subminiature tubes according to H. E. Gruen of Armour Research Foundation. Up to 2.5 octaves within the range of 0.8 to 75 mc

are covered by unit occupying less than 2.5 cu in. Below 16 mc, untuned circuits give a frequency stability of 5 to 10 ppm. Plug-in package design may be varied physically for special applications without sacrificing specified performance features.

• **Fast Figures.** T. H. Bonn of Sperry Rand tells how complementing series-type amplifiers handle information rates up to 2.5 mc in an all-magnetic computer operating at a 660-ke information rate. When properly programmed, this computer has a speed equal to Univac I. Circuit design considerations and various types of core materials and their figures of merit are presented.

• **Time Saver.** Need for manually reading and replotting telemetered data is eliminated by device described by H. B. Riblet of Johns Hopkins University. Recording characteristics can be made to conform with the transfer function of a telemetering system, relating data values and corresponding displacements, whether linear or nonlinear, with a prescribed scale factor.

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INSIDE FRONT COVER

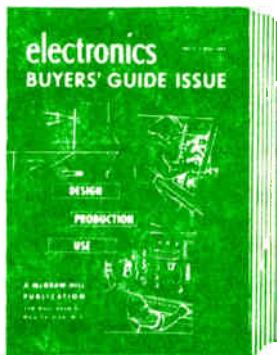
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# NOW IN YOUR HANDS . . .

THE ALL NEW 1957 electronics BUYERS' GUIDE!

USE IT THROUGHOUT THE YEAR AS YOUR STANDARD REFERENCE SOURCE



For 17 years . . .

## THE BUYING GUIDE

For the electronics industry

As easy to use as the telephone book, your all new 1957 electronics BUYERS' GUIDE features:

**COMPLETENESS:** 1070 pages of products, manufacturers, trade names, manufacturers' representatives, and professional services.

**ACCURACY:** The entire electronic industry is questioned from scratch each year. For the 1957 GUIDE, there were 181 changes, 586 deletions (of the deletions, many were due to mergers and name changes), and 872 additions. Total

number of manufacturers increased to 4013 from 3727 in 1956. 87 new products were added in 1957 for a total of 1773.

**USE:** Whether you are concerned with the design, production, or use of electronic circuitry, turn to the listings of the **electronics BUYERS' GUIDE**. Here you will find the page numbers that refer you to catalog-type advertising, specially prepared to supplement the listings and give you the technical information you must have to specify and purchase electronic and allied products.



A McGraw-Hill Publication, 330 West 42nd Street, New York 36, N. Y.



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(SEC. 34.9 P.L.&R.)  
NEW YORK, N. Y.

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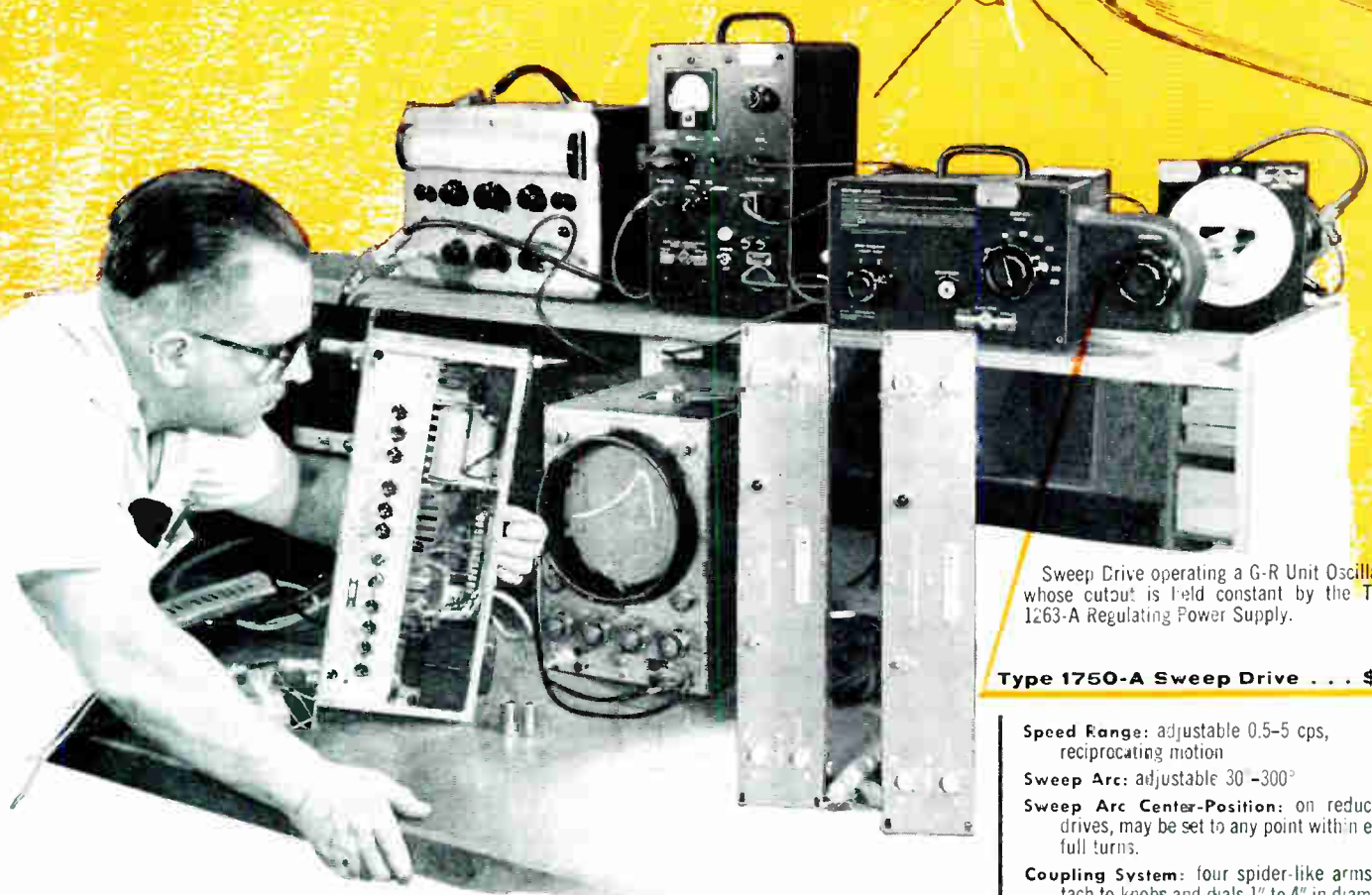
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# Breaking Production Bottlenecks with Automatic Sweep



*Spencer-Kennedy* wide-band amplifiers for community TV distribution systems required tedious and time-consuming checks at many points to insure acceptable gain and response uniformity. Standard test procedure called for checks at 15 different frequencies, and if any adjustments were made, it was usually necessary to repeat the entire set of measurements. Test time was about an hour per unit and would often cause severe production bottlenecks.

Engineers at SKL successfully broke the bottleneck with the G-R Type 1750-A Sweep Drive. The response characteristic, now displayed on an oscilloscope, is instantly obtained over the entire band from 54 to 216 Mc. Adjustment effects are observed easily and immediately. Average testing time is now cut by 50 percent with no loss in accuracy — the bottleneck is eliminated with a considerable saving in production costs.

The Sweep Drive can help you. It's more than just a labor saver. It can be attached to a wide variety of manually-operated instruments to make them sweep devices, thus extending their usefulness and versatility.

By simply substituting a higher frequency Unit Oscillator SKL found they could also test their new ultra-wide-band amplifier with the same Sweep Drive setup.

Sweep Drive operating a G-R Unit Oscillator whose output is held constant by the Type 1263-A Regulating Power Supply.

**Type 1750-A Sweep Drive . . . \$460**

- Speed Range:** adjustable 0.5-5 cps, reciprocating motion
  - Sweep Arc:** adjustable 30°-300°
  - Sweep Arc Center-Position:** on reduction drives, may be set to any point within eight full turns.
  - Coupling System:** four spider-like arms attach to knobs and dials 1" to 4" in diameter and to ¼" and ⅜" shafts.
  - Limit Switch Circuit:** disconnects and brakes the motor if preset limits of shaft travel are accidentally exceeded.
  - CRO Deflection Circuit:** voltage proportional to shaft angle is provided for application to oscilloscope horizontal deflection plates.
  - Blanking Circuit:** eliminates the return CRO trace and produces a reference base line.
  - Rated Maximum Torque:** 24 oz.-in.
- Used in combination with G-R's popular line of Unit Oscillators, the Sweep Drive makes available sweep generators for the frequency ranges: 500 kc-to-50 Mc, 50 Mc-to-250 Mc, 65 Mc-to-500 Mc, 250 Mc-to-920 Mc, and 900 Mc-to-2000 Mc. The Drive can be coupled to either the oscillator's slow-motion drive for sweeping over small ranges or coupled directly to the main shaft to take advantage of the extremely wide frequency ranges offered by G-R Unit Oscillators.
- The Type 1263-A Regulating Power Supply has been especially designed to hold oscillator output constant for sweep-type presentation. Regulation is held to within ±2% of the preset output level, independent of frequency.

## GENERAL RADIO Company

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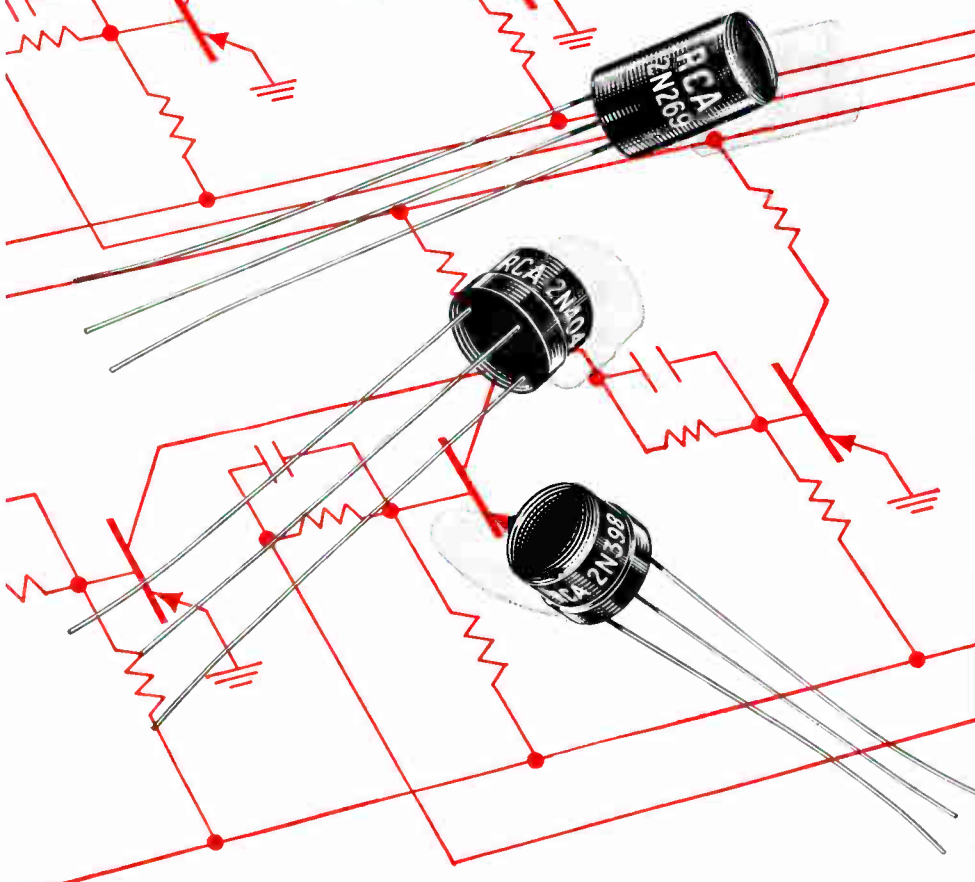
1182 Los Altos Ave., Los Altos, California SAN FRANCISCO



All G-R Products  
are now covered by a

*2-Year Warranty*

# RCA COMPUTER TRANSISTORS



**Specifically designed to meet critical military and industrial computer applications**

**RCA-2N404, RCA-2N269**—feature a maximum collector-to-emitter saturation “bottoming” voltage of only 150 millivolts with a current gain of 30. This feature makes possible the design of stable “on” circuits and allows highly flexible design of digital equipment. Specification of  $I_{CO}$  at  $80^{\circ}\text{C}$  as well as at  $25^{\circ}\text{C}$  permits the design of “off” circuits which are stable (absolute) for wide variations in temperature. A new method of controlling switching-time is achieved by controlling the maximum stored charge in the base region. Circuits using RCA-2N404 and -2N269 can thus be designed to have predictable switching speed and complete unit-to-unit interchangeability.

**RCA-2N398**—features an exceptionally high collector voltage rating which now permits the design of neon-indicator circuits where the transistor is capable of directly switching the total firing voltage of the indicator lamp. This simple circuit design provides for improved system reliability. The high collector voltage rating is also useful in the design of other high-voltage “on-off” control circuits such as relay pullers, incandescent lamp drivers, and direct indicating counters.

For information on how to apply COMPUTER TRANSISTORS in your designs, contact the RCA Field Representative at the RCA Field Office nearest you. For technical bulletins, write RCA, Commercial Engineering, Section II-19-NN-2, Somerville, N. J.



**SEMICONDUCTOR DIVISION**

RADIO CORPORATION OF AMERICA

Somerville, New Jersey

World Radio History

## MEDIUM-SPEED SWITCHING TRANSISTORS

**RCA-2N404 (JETEC Size Group 30 Case), and RCA-2N269**

- have high current gain
- provide reliable operation over wide temperature range
- have controlled stored charge

## 105-VOLT SWITCHING TRANSISTOR

**RCA-2N398**

- uses JETEC Size Group 30 Case designed for automation requirements
- improves system reliability
- simplifies neon-indicator circuitry

### TECHNICAL DATA—RCA-2N404 and RCA-2N269

Max. Ratings	$V_C$	$I_C$	Collector Dissipation	Storage Temp.
	-25 volts	-100 ma	120 mw at $25^{\circ}\text{C}$ 35 mw at $55^{\circ}\text{C}$ 10 mw at $71^{\circ}\text{C}$	-65 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$
Characteristics* (at ambient temperature of $25^{\circ}\text{C}$ unless otherwise specified)				
	Typical Values	Range Values		
Collector Cutoff Current ( $V_C = -12\text{v}$ , $I_E = 0$ )	-2 $\mu\text{A}$	Min.	Max.	-5 $\mu\text{A}$
Collector Cutoff Current ( $V_C = -12\text{v}$ , $I_E = 0$ , $T_A = 80^{\circ}\text{C}$ )	-45 $\mu\text{A}$			-90 $\mu\text{A}$
Collector-to-Emitter Saturation Voltage ( $I_B = 0.4\text{ ma}$ , $I_C = -12\text{ ma}$ )	-100mv			-150mv
Alpha Cutoff Frequency ( $I_E = 10\text{ ma}$ , $V_C = -6\text{v}$ )	12Mc			4Mc
Stored Base Charge ( $I_C = -10\text{ ma}$ , $I_B = -1.0\text{ ma}$ )	800 <small>(100 picocoulombs)</small>			1400 <small>(100 picocoulombs)</small>

### TECHNICAL DATA—RCA-2N398

Max. Ratings	$V_C$	$I_C$	Collector Dissipation	Storage Temp.
	-105 volts	-100 ma	50 mw at $25^{\circ}\text{C}$ 10 mw at $55^{\circ}\text{C}$	-65 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$
Characteristics* (at ambient temperature of $25^{\circ}\text{C}$ unless otherwise specified)				
	Typical Values	Range Values		
Collector Breakdown Voltage ( $I_C = -50\mu\text{A}$ , $I_E = 0$ )	-150 volts	-105 volts		
Collector-to-Emitter (Punch-Through) Voltage ( $I_E = -1\mu\text{A}$ , $I_C = 0$ )	-150 volts	-105 volts		
Collector Cutoff Current ( $V_C = -25\text{v}$ , $I_E = 0$ )	-6 $\mu\text{A}$			-14 $\mu\text{A}$
DC Current Transfer Ratio ( $V_{CE} = -0.35\text{v}$ , $I_E = -0.25\text{ ma}$ )	60	20		

\*All voltage values are given with respect to the base, unless otherwise specified.

**East:** 744 Broad Street, Newark, N. J.  
HUmboldt 5-3900

**Midwest:** Suite 1181, Merchandise Mart Plaza  
Chicago, Ill. WHitehall 4-2900

**West:** 6355 E. Washington Blvd., Los Angeles, Calif.  
RAYmond 3-8361

**Gov't:** 224 N. Wilkinson Street, Dayton, Ohio  
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